5-3431-205-15

TM 5-3431-205-15

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE MANUAL

WELDING MACHINE, ARC

GENERATOR, GASOLINE ENGINE DRIVEN, 300 AMP, DC

(LIBBY MODEL LE 300) FSN 3431-810-9696
(LIBBY MODEL LEW-300) FSN 3431-991-2961
(LIBBY MODEL LEB-300) FSN 3431-072-0327

This copy is a reprint which includes current pages from Changes 2 and 3.

HEADQUARTERS, DEPARTMENT OF THE ARMY
JULY 1968

TAGO 20030A

READEX FICHE best copy available

D 101.11:

Reproduced from poor document.

SAFETY PRECAUTIONS

Before Operation

When filling the fuel tank, always provide a metal-to-metal contact between the container and the fuel tank. This will prevent a static spark from being generated as fuel flows over metallic surfaces.

Do not allow smoking or the use of an open flame in the immediate vicinity while servicing the batteries. Batteries generate hydrogen, a highly explosive gas.

Exercise care when handling electrolyte. Avoid breathing fumes and do not permit electrolyte to come in contact with skin. If electrolyte touches the skin, wash the effected area immediately with a baking soda solution or with a liberal amount of water. If electrolyte splashes into eyes, wash immediately with a liberal amount of clean water and obtain medical aid as soon as possible.

During Operation

Do not fill the fuel tank while the engine is running. Fuel spilled on a hot engine may explode and cause injury to personnel.

When the welding machine is operated in an enclosed area, be sure the exhaust fumes are piped to the outside. Exhaust gases contain carbon monoxide. Continued breathing of exhaust fumes can be fatal.

Do not operate any welding machine without a welder's helmet. The flash of the welding arc can cause eye injury.

Do not adjust welding controls while maintaining arc.

After Operation

Use only approved cleaning solvents to prevent the possibility of fire or poisoning.

Before performing any welding or soldering operation on the fuel tank, steam clean the tank continuously for at least 2 hours to eliminate explosive vapors.

Changes in force: C 2 and C 3

CHANGE No. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C. *7 December 1972*

Operator, Organizational, Direct and General Support and Depot Maintenance Manual

WELDING MACHINE, ARC; GENERATOR; GASOLINE ENGINE DRIVEN; 300 AMP, DC
(LIBBY MODEL LE300) FSN 3431-810-9696
(LIBBY MODEL LEW300) FSN 3431-991-2961
(LIBBY MODEL LEB300) FSN 3431-072-0329

TM 5-3431-205-15, 29 July 1968, is changed as follows:

Page 133. Appendix A is superseded as follows:

APPENDIX A
REFERENCES

A-1. Fire Protection

TB 5-4200-200-10	Hand Portable Fire Extinguisher Approved for Army Users.

A-2. Lubrication

LO 5-3431-205-12	Welding Machine, ARC: Generator; Engine Driven; 300 AMP (Libby Model LE-300) w/Continental Engine Model FS244.
C9100-IL	Fuels, Lubricants, Oils and Waxes.

A-3. Radio Suppression

TM 11-483	Radio Interference Suppression.

A-4. Maintenance

TM 5-764	Electric Motor and Generator Repair.
TM 5-3431-205-20P	Organizational Maintenance Repair Parts and Special Tools Lists; Welding Machine, ARC, Generator, GED, 300 AMP, DC (Libby Welding Models) (Model LE-300) FSN 3431-810-9696 (Model LEW-300) FSN 3431-991-2961 (Model LEB-300) FSN 3431-072-0327.
TM 5-3431-205-35P	Direct and General Support and Depot Maintenance Repair Parts and Special Tools Lists: Welding Machine, ARC, Generator, GED, 300 AMP, DC (Libby Welding Models) (Model LE-300) FSN 3431-810-9696 (Model LEW-300) FSN 3431-991-2961 (Model LEB-300) FSN 3431-072-0327.
TM 9-207	Operation and Maintenance of Ordnance Materiel in Cold Weather (0° to —65°F).

---

*This change supersedes C 1, 2 October 1969.

TM 9-6140-200-14	Operator, Organizational, DS, and GS Maintenance Manual: Storage Batteries: Lead-Acid Type.
TM 38-750	The Army Maintenance Management System (TAMMS)

A-5. Shipment and Storage

TB 740-97-2	Preservation of USAMEC Mechanical Equipment for Shipment and Storage.
TM 740-90-1	Administrative Storage of Equipment.

Page 134. Appendix B is superseded as follows:

APPENDIX B
BASIC ISSUE ITEMS LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED

Section I. INTRODUCTION

B-1. Scope

This appendix lists items required by the operator for operation of the welding machine.

B-2. General

This list is divided into the following sections:

a. Basic Issue Items List—Section II. Not applicable.

b. Items Troop Installed or Authorized List—Section III. A list of items in alphabetical sequence, which at the discretion of the unit commander may accompany the welding machine. These items are NOT SUBJECT TO TURN-IN with the welding machine when evacuated.

B-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items List, Section II, and Items Troop Installed or Authorized, Section III.

a. Source, Maintenance and Recoverability Code (SMR). Not applicable.

b. Federal Stock Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the Federal item name and any additional description of the item required.

d. Unit of Measure (U/M). A two character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Furnished with Equipment (BIIL). Not applicable.

f. Quantity Authorized (Items Troop Installed or Authorized). This column indicates the quantity of the item authorized to be used with the equipment.

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) SMR Code	(2) Federal stock Number	(3) Description			(4) Unit of meas	(5) Qty auth
			Ref No. & mfr code	Usable on code		
	7520-559-9618	CASE, Maintenance and Operation Manual			EA	1
	4210-555-8837	EXTINGUISHERS, Fire			EA	1
	5979-878-3791	ROD, Ground			EA	1

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:

VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-25A (qty rqr block No. 182) organizational maintenance requirements for Welding.

GPO 894-258

Changes in force: C 1 and C 2

TM 5-3431-205-15
C 2

CHANGE
NO. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D. C. *17 April 1970*

Operator, Organizational, DS, GS, and Depot Maintenance Manual WELDING MACHINE; ARC; GENERATOR: GED; 300 AMP, DC; (LIBBY MODEL LE 300) FSN 3431-810-9696; (LIBBY MODEL LEW 300) FSN 3431-991-2961; (LIBBY MODEL LEB 300) FSN 3431-072-0327

TM 5-3431-205-15, 29 July 1968, is changed as follows:
Reverse of cover page, before Safety Precautions, add the following:

WARNING

RADIATION HAZARD

This equipment contains the following *radioactive* item:
TEMPERATURE INDICATOR, Located on Operator's Control Panel
Instructions for safe handling, maintenance storage, and disposition of this item is contained in TB 750-248.

Page 133, Appendix A, paragraph 2, add:

TB 750-248	Instructions for the Safe handling, Maintenance Storage, and Disposal of Radioactive Materiel Managed by USAMECOM.

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:
KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:
To be distributed in accordance with DA Form 12-25, Sec I (qty rqr Block #182), Organizational maintenance requirements for Equipment: Welding Machines.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1970-390-942/1800

TECHNICAL MANUAL
No. 5-3431-205-15

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *29 July 1968*

OPERATOR, ORGANIZATIONAL, DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE MANUAL WELDING MACHINE, ARC: GENERATOR: GASOLINE ENGINE DRIVEN; 300 AMP, DC; (LIBBY MODEL LE 300) FSN 3431-810-9696, (LIBBY MODEL LEW 300) FSN 3431-991-2961, (LIBBY MODEL LEB 300) FSN 3431-072-0327

CHAPTER 1. INTRODUCTION

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CHAPTER 2. INSTALLATION AND OPERATION INSTRUCTIONS

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III.	Controls and instruments	2-9, 2-10	15
IV.	Operation of equipment	2-11—2-14	23
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VI.	Operation of auxiliary material used in conjunction with the equipment	2-21	28

CHAPTER 3. OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

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III.	Preventive maintenance checks and services	3-6, 3-7	30
IV.	Operator's maintenance	3-8—3-13	36
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X.	Engine electrical system	3-31—3-37	46
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CHAPTER 5. DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE

		Paragraph	Page
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*This manual supersedes TM 5-3431-205-15, 4 October 1963, TM 5-3431-214-15, 15 Januairy 1964, and TM 5-3431-215-15, 1 April 1965.

		Paragraph	Page
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CHAPTER 1
INTRODUCTION

Section I. GENERAL

1–1. Scope

a. These instructions are published for the use of the personnel to whom the Arc Welding Machine, Models LE 300, LEW 300, and LEB 300 is issued. Chapters 1 through 4 provide information on the operation, preventive maintenance services, and organizational maintenance of the equipment, accessories, components, and attachments. Chapter 5 provides information for direct, general support, and depot maintenance. Also included are descriptions of main units and their functions in relationship to other components.

b. Appendix A contains a list of publications applicable to this manual. Appendix B contains the list of basic issue items and maintenance and operating supplies authorized the operator of this equipment. Appendix C contains the maintenance allocation chart.

c. Numbers in parentheses on the illustrations indicate quantity. Numbers preceding nomenclature callouts on illustrations indicate the preferred maintenance sequence.

1–2. Forms and Records

a. DA Forms and records used for equipment maintenance will be only those prescribed in TM 38–750.

b. Report of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to: Commanding General, U.S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Blvd., St. Louis, Mo. 63120.

Section II. DESCRIPTION AND DATA

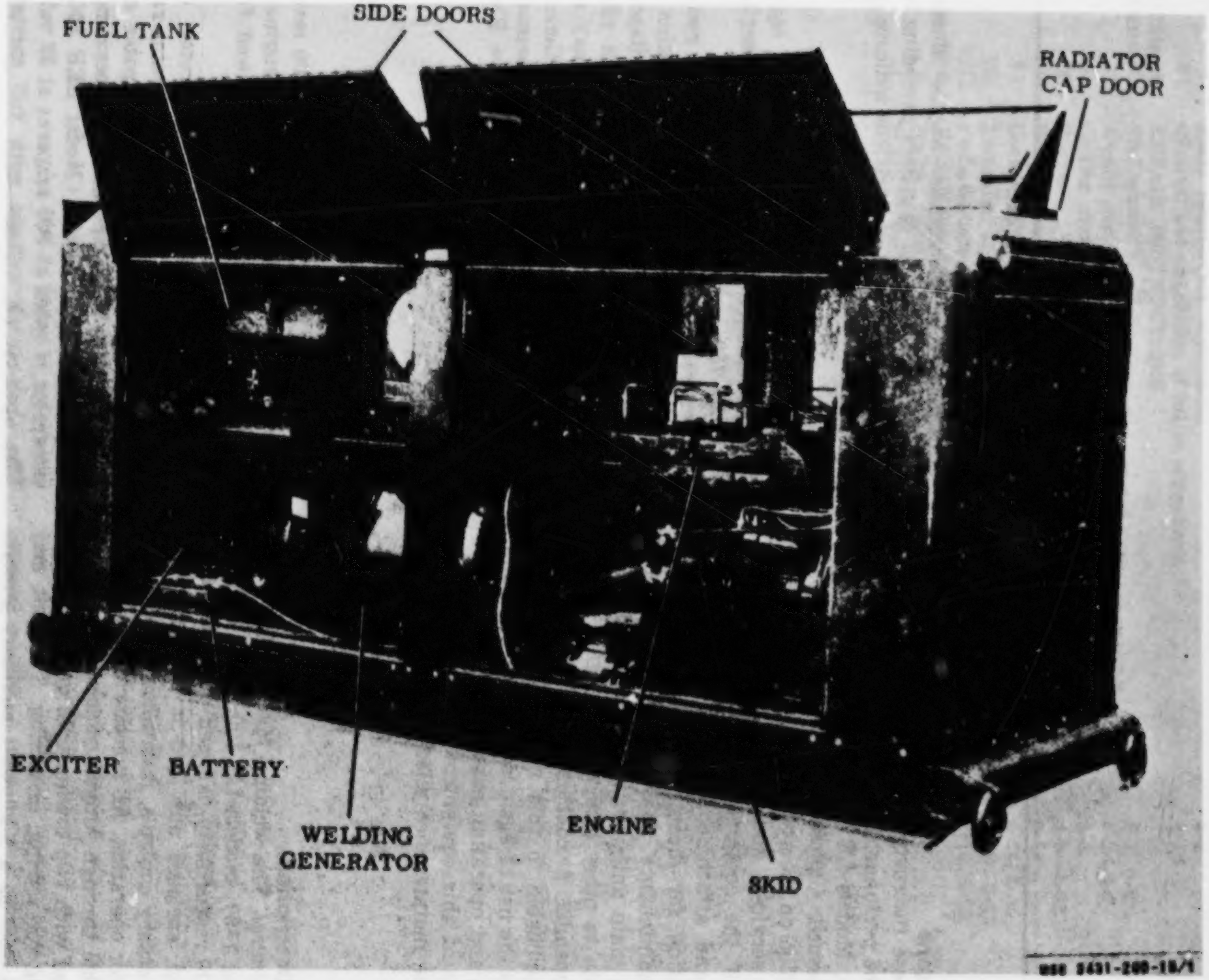
1–3. Description

a. General. The welding Machine (figs. 1–1, 1–2, and 1–3), models LE 300, LEW 300, and LEB 300 respectively, is a self-contained, skid-mounted, enclosed unit and is equipped with the necessary controls, instruments and accessories for operation. All accessories are readily accessible through hinged panels. The unit is equipped with two towing eyes on each end of the skid for towing, or lifting. The unit may also be used as a 3-kilowatt auxiliary generator.

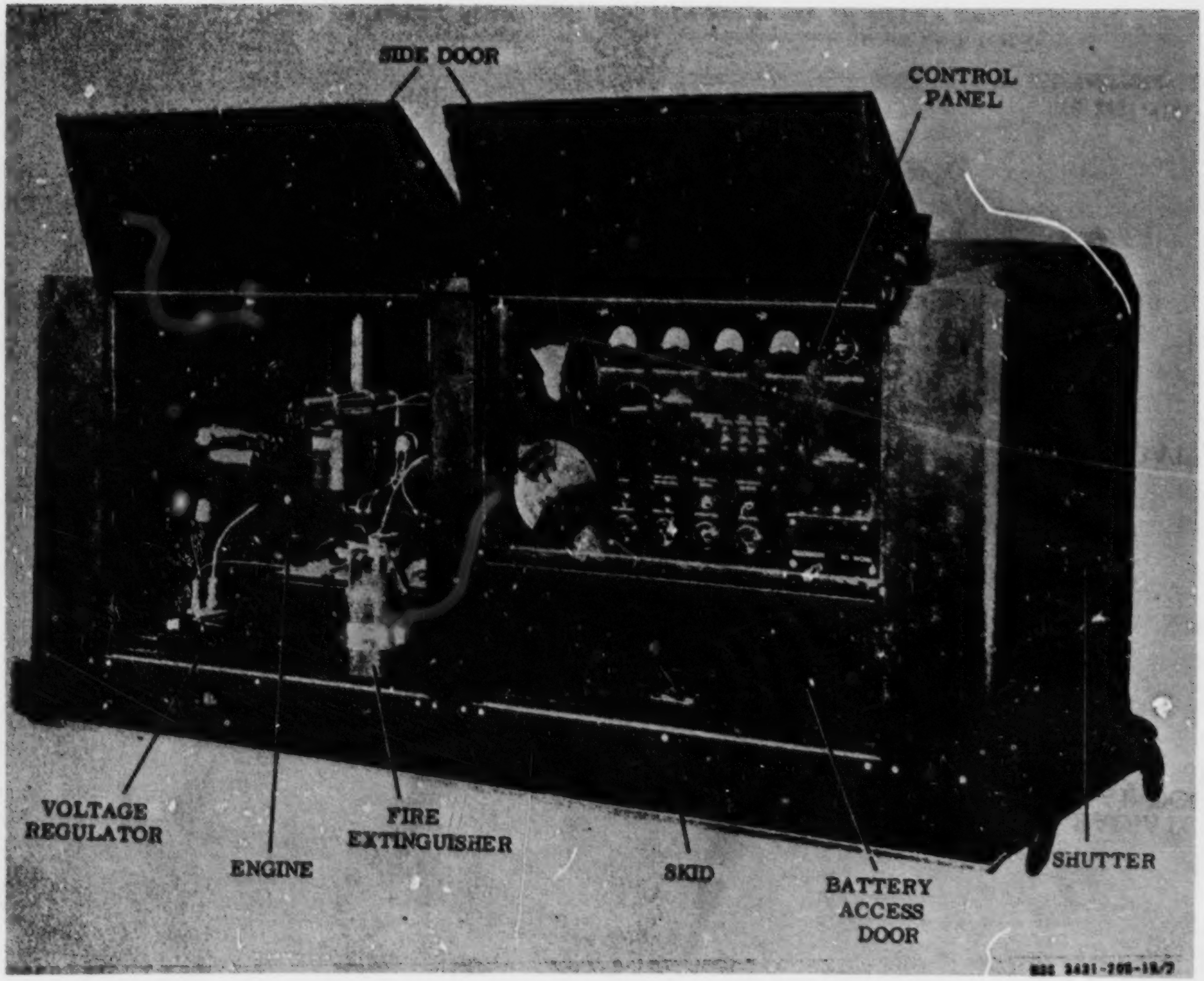
b. Engine. The engine (fig. 1–1) is a six-cylinder, water-cooled, gasoline engine, has full-pressure lubrication and is designed to operate at 1400 revolutions per minute under load. (Model LEB 300 operates at 1800 revolutions per minute). The direction of engine rotation is counterclockwise when viewed from flywheel end of engine.

c. Generator. The welding generator (fig. 1–1) is a compound-wound, dc generator rated at 300 amperes at 40 volts but capable of a range of 60 to 375 amperes while operating at a 60 percent duty cycle. (Model LEB 300 dc generator is rated at 300 amperes at 32 volts). The open-circuit voltage with full excitation is 70 to 80 volts. The generator is provided with interpole windings and is fan cooled. The rotor is connected to the engine flywheel through a fixed coupling.

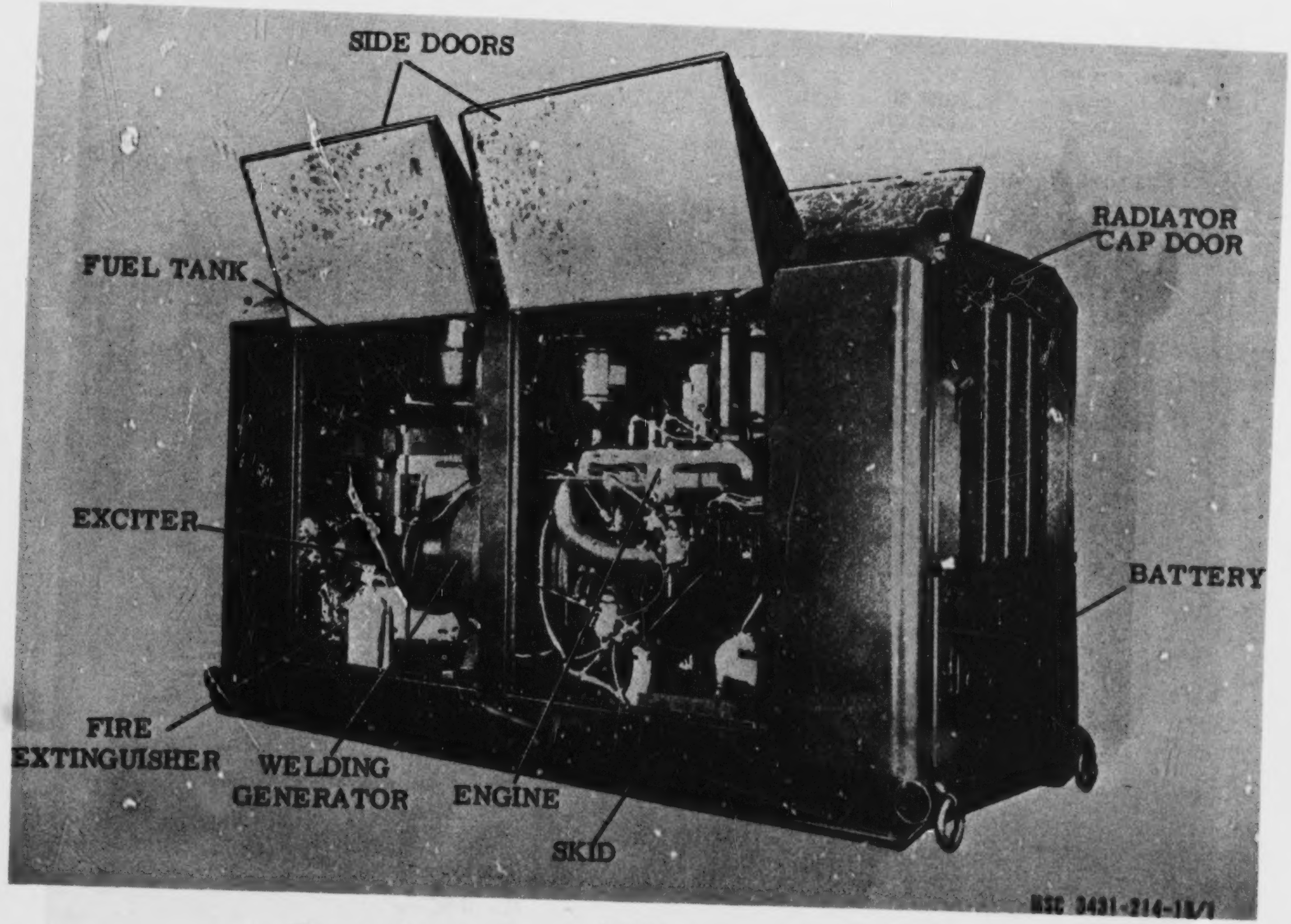
d. Exciter. The exciter (fig. 1–1) is a heavy-


FUEL TANK
SIDE DOORS
RADIATOR CAP DOOR
EXCITER
BATTERY
WELDING GENERATOR
ENGINE
SKID
ME 3431-200-10/1

1 right front
Figure 1-1. Welding machine, three-quarter view (Model LF 300).

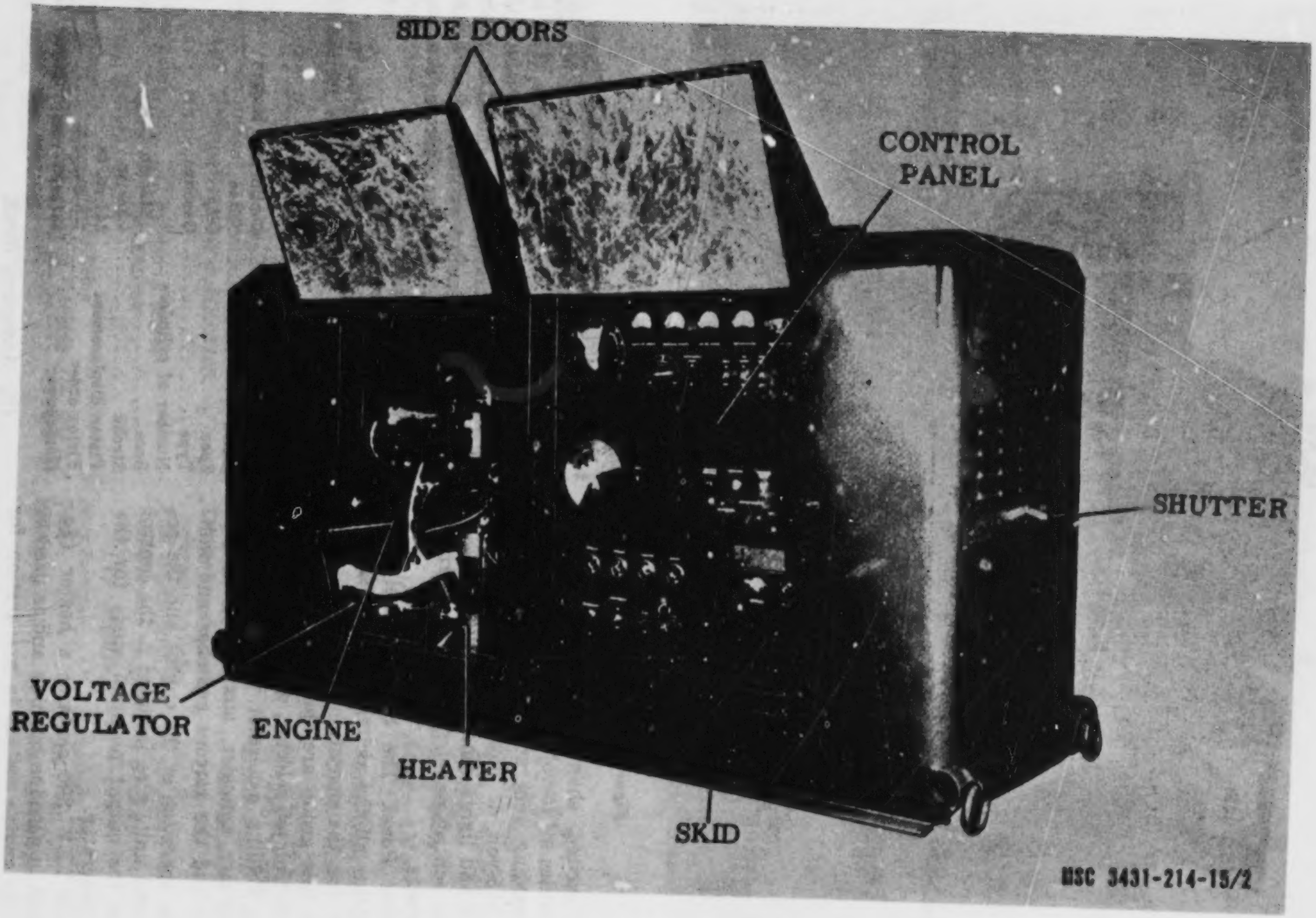

SIDE DOOR
CONTROL PANEL
VOLTAGE REGULATOR
ENGINE
FIRE EXTINGUISHER
SKID
BATTERY ACCESS DOOR
SHUTTER

2 left rear
Figure 1-1—Continued.

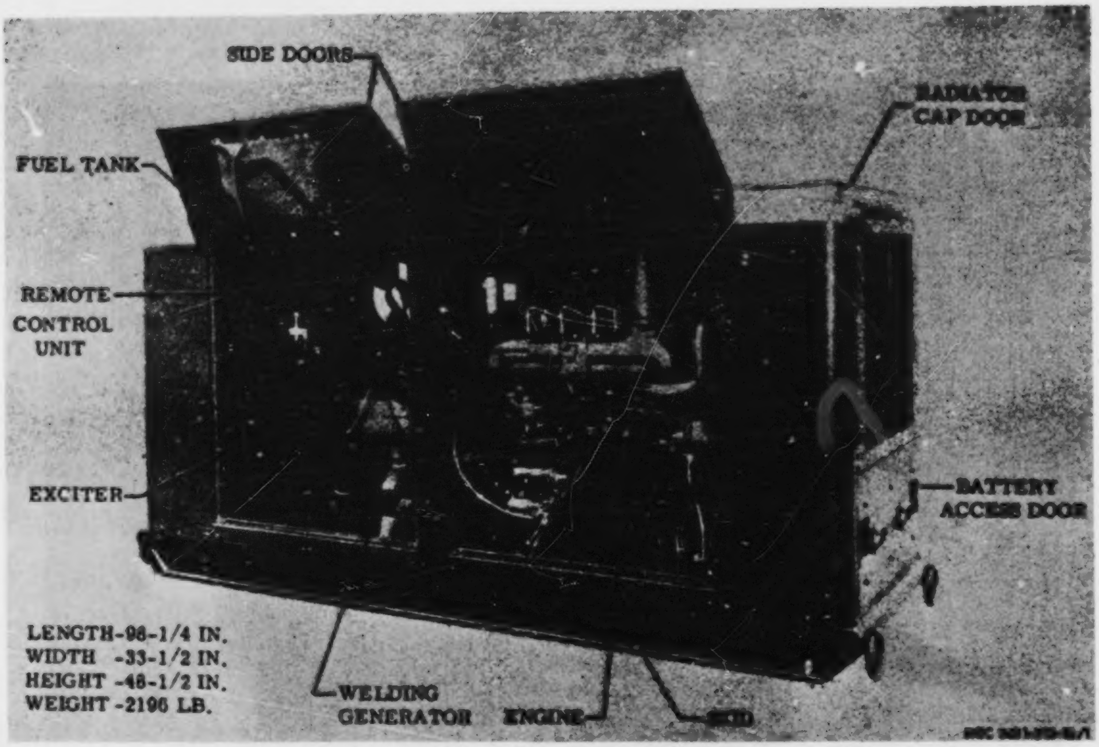

SIDE DOORS
RADIATOR CAP DOOR
FUEL TANK
EXCITER
BATTERY
FIRE EXTINGUISHER
WELDING GENERATOR
ENGINE
SKID
MSC 3431-214-15/1

1 right front

Figure 1-2. Welding machine, right front, three-quarter view (Model LEW 300).


SIDE DOORS
CONTROL PANEL
SHUTTER
VOLTAGE REGULATOR
ENGINE
HEATER
SKID
USC 3431-214-15/2

2 left rear
Figure 1-2—Continued.



1 right front

Figure 1-3. Welding machine, three-quarter view (Model LEB 300).

duty, self-excited, shunt-wound dc generator which provides a 115-volt dc excitation voltage for the welding generator. The exciter also provides 115-volt dc power to operate small hand tools and lights connected to utility outlets on the control panel. The exciter is rated at 3 kilowatts.

e. Control Panel. The control panel (fig. 1-2) contains all the switches and indicators necessary for the operation of the unit. Included in this group are the polarity switch, current control, job selector, welding generator ammeter, welding generator voltmeter, auxiliary generator ammeter, auxiliary generator voltmeter and the various switches and indicators for operation of the engine and the remote control unit. Also included in the control panel are the output terminal studs for the welding generator.

f. Model LEW 300 contains a heater (fig. 1-2) which is gasoline burning and is used to preheat the engine coolant in preparation for starting at extreme low temperatures.

1-4. Identification and Tabulated Data

a. Identification. The Arc Welding Machine has three major identification plates. The information contained on the plates include the machine, engine, and magneto model numbers; the capacities, shipping weight, overall height, width, length, and the manufacturer's name.

b. Tabulated Data.

(1) *Welding machine.*

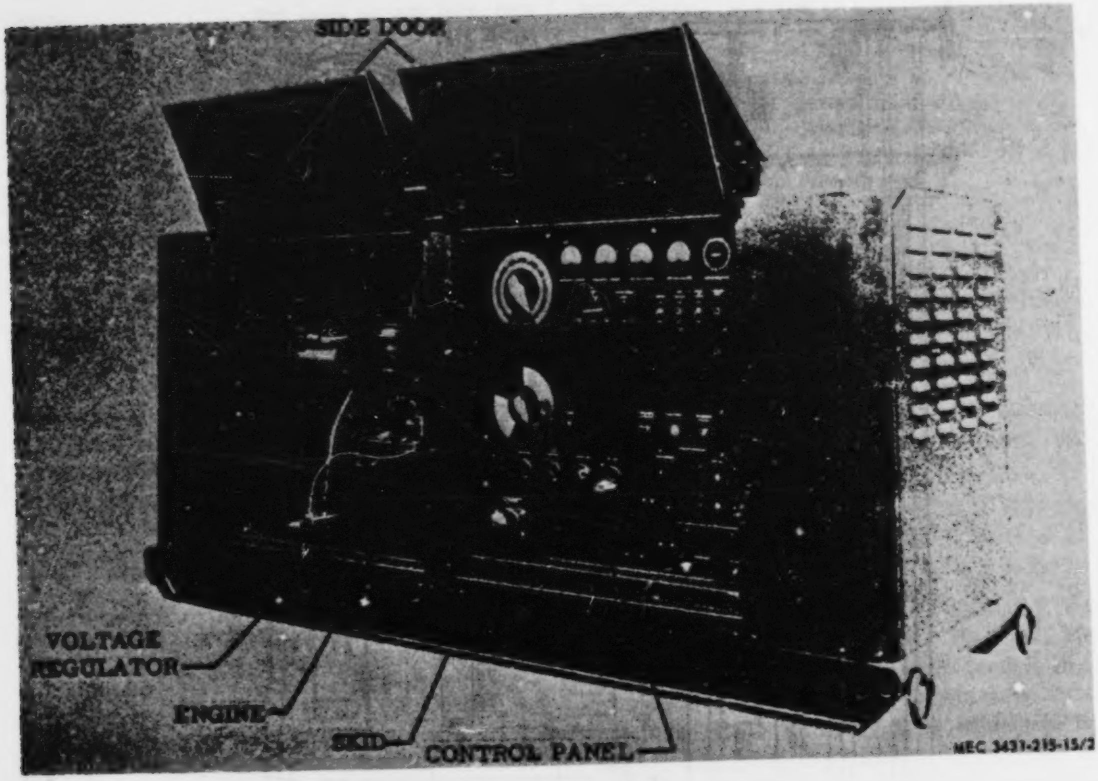
Manufacturer	Libby Welding Co., Inc.
Models	LE-300, LEW 300 and LEB 300

(2) *Engine.*

Manufacturer	Continental Motors
Model	FS244
Spec.	6065
Type	Gasoline
Number of cylinders	6
Bore	3 7/16 in.
Stroke	4 3/8 in.
Piston displacement	244 cu. in.
Firing order	1-5-3-6-2-4
Horsepower	48(1400 rpm); Model LEB 300 1800 rpm

(3) *Accessory items.*

(a) *Carburetor.*



2 left rear

Figure 1-3—Continued.

Manufacturer	Zenith Carburetor
Model	0-12368

(*b*) *Governor.*

Manufacturer	Hoff Products
Model	GD303C4612

(*c*) *Fuel strainer MS51086.*

(*d*) *Oil filter.*

Manufacturer	Fram Corporation
Model	F-21P

(*e*) *Air cleaner.*

Manufacturer	Air Maze
Model	C-18994

(*f*) *Battery charging generator MS-13823.*

Brush spring tension	28 ounces

(*g*) *Voltage regulator MS13805.*

(*h*) *Magneto.*

Manufacturer	Fairbanks Morse
Model	FM-E6B16V

(*i*) *Starter motor.*

Manufacturer	Delco-Remy
Model	1108232 (1108266 for Model LEB 300)
Brush spring tension	24 ounces

(*j*) *Spark plug.*

Manufacturer	Champion
Model	XED-16

(*k*) *Idling regulator.*

Manufacturer	Lincoln Electric Co.
Model	R-57

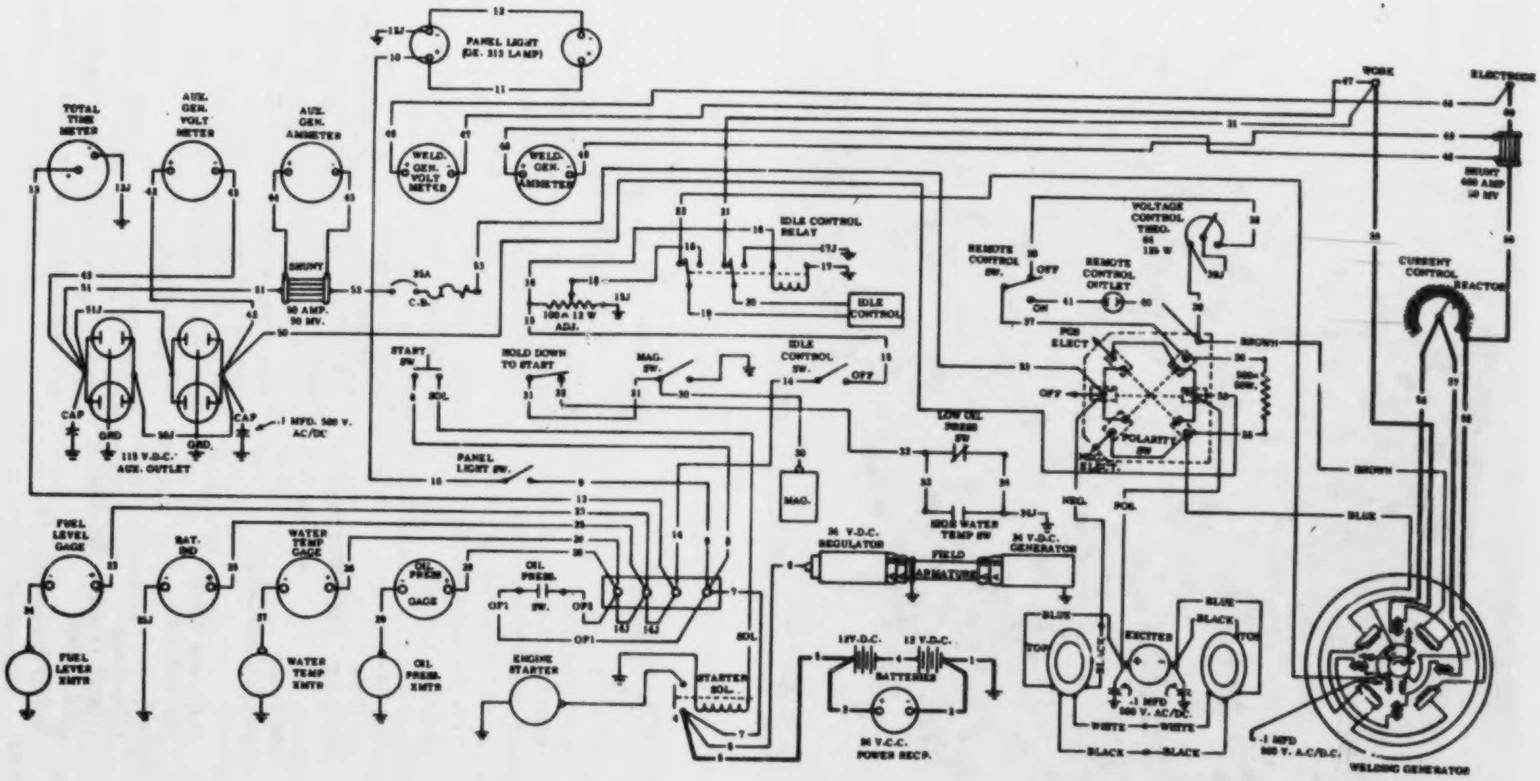
(*l*) *Battery MS35000-3.*

(*m*) *Coolant heater (Model LEW-300 only).*

Manufacturer	South Wind Division
Model	939-C24
Current consumption:	
Starting	24 volts; 11 amps
Burning	24 volts; 1 amp
Output	23,000 Btu/hr (British thermal units per hour)
Temperature setting overheat switch	245° F.
Fuel consumption	0.26 gph
Fuel pressure required	1 to 15 psi

(4) *Welder.*

Manufacturer	Lincoln Electric Co.
Type	300
RPM	1400 (1800 for Model LEB 300)


PANEL LIGHT (GE. 313 LAMP)
TOTAL TIME METER
AUX. GEN. VOLT METER
AUX. GEN. AMMETER
WELD. GEN. VOLT METER
WELD. GEN. AMMETER
WORK
ELECTRODE
SHUNT 600 AMP 10 MV
IDLE CONTROL RELAY
IDLE CONTROL
SHUNT
50 AMP. 50 MV.
25A
C.B.
100 Ω 12 W ADJ.
CAP
GRD
GRD.
.1 MFD. 500 V. AC/DC
115 V.D.C. AUX. OUTLET
START SW.
SOL.
HOLD DOWN TO START
MAG. SW.
IDLE CONTROL SW.
OFF
PANEL LIGHT SW.
MAG.
LOW OIL PRESS SW
HIGH WATER TEMP SW
24 V.D.C. REGULATOR
FIELD
ARMATURE
24 V.D.C. GENERATOR
REMOTE CONTROL SW.
ON
REMOTE CONTROL OUTLET
VOLTAGE CONTROL THEO. 66 125 W
CURRENT CONTROL
REACTOR
POS ELECT
NEG. ELECT.
POLARITY SW
BROWN
BLUE
NEG.
POS.
FUEL LEVEL GAGE
BAT. IND
WATER TEMP GAGE
OIL PRESS GAGE
OIL PRESS. SW.
OP1
OP2
FUEL LEVER XMTR
WATER TEMP XMTR
OIL PRESS. XMTR
ENGINE STARTER
STARTER SOL.
12V.D.C.
12 V.D.C.
BATTERIES
24 V.C.C. POWER RECP.
TOP
BLACK
EXCITER
.1 MFD 500 V. AC/DC.
WHITE
.1 MFD 500 V. A.C/D.C.
WELDING GENERATOR

NSC 3431-205-15/4

1 Model LM 300

Figure 1–4. Wiring diagram.

Rating	**300 amps at 400 volts (300 amps at 32 v for Model LEB 300)**
Current range	**60 to 375 amps**
Duty cycle	**60%**
Brush spring tension	**32 ounces**

(5) *Operating pressure and temperature.*

Gas pressure range	**1 1/2 to 2 1/4 lbs**
Water pressure range	**4 1/2 to 7 lbs**
Water operating temperature	160° to 200° F. (LEB 300)
Water operating temperature	160° to 180° F.

(6) *Capacities.*

Fuel tank	**15 gal.**
Coolant	**20 qts (15 qts for Model LEW 300)**
Lubricating oil	**6 qts**
Air cleaner (Model LEW 300)	**1/2 qt**

(7) *Adjustment data.*

V-belts	**5/8 in. (deflection)**
Engine tappet setting (hot)	**0.014 in.**
Operating speed:	
Full load	**1400 rpm (1800 rpm for Model LEB 300)**
Low idle	**950 rpm (1000 rpm for Model LEB 300)**

(8) *Nut and bolt torque data.*

Camshaft nut	**120-130 ft-lbs**
Cylinder head bolts	**35-40 ft-lbs**
Flywheel	**35-40 ft-lbs**
Gear cover, water pump and oil pan	**25-30 ft-lbs**
Main bearing caps and connecting rods	**85-90 ft-lbs**
Manifold	**25-30 ft-lbs**

(9) *Wiring diagram.*

Model LE 300	**Figure 1-4①.**
Model LEW	**Figure 1-4③.**
Model LEB 300	**Figure 1-4②.**

(10) *Shipping dimensions.*

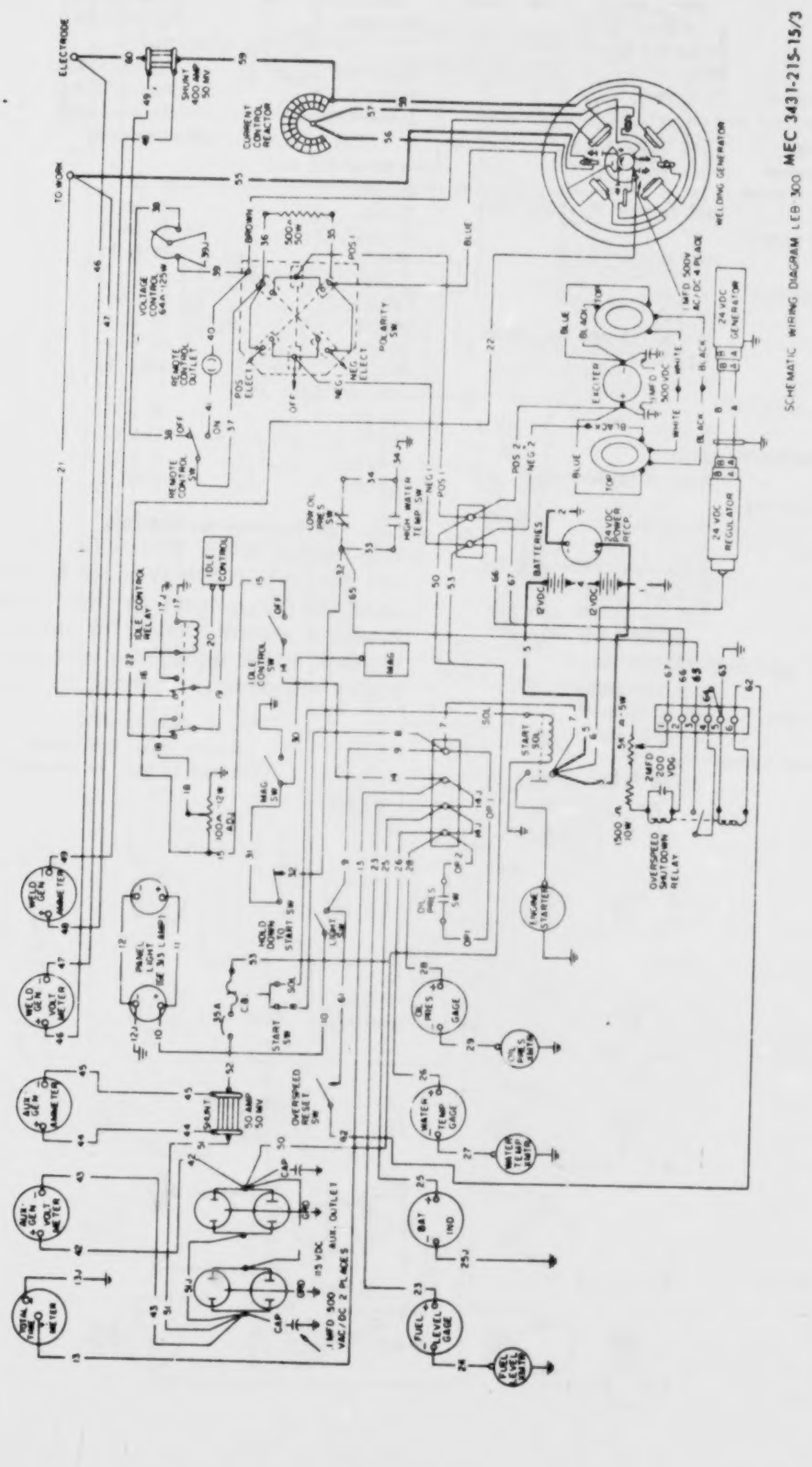
Model LE 300	
Length	**97 in.**
Width	**33 in.**
Height	**45 in.**
Weight	**2315 lbs**
Model LEW 300	
Length	**104 in.**
Width	**36 in.**
Height	**54 in.**
Weight	**2494 lbs**
Model LEB 300	
Length	**98 1/4 in.**
Width	**33 1/2 in.**
Height	**48 1/2 in.**
Weight	**2196 lbs**

1-5. Difference in Models

This manual covers Models LE 300, LEW 300 and Model LEB 300 Welding Machine. Model LEW 300 differs from the other models in that it uses a coolant heater for starting in cold weather. Other differences in models is thoroughly discussed throughout the manual.

2 **Model LEW 300**

Figure 1-4—Continued.
(Located in back of manual)


SCHEMATIC WIRING DIAGRAM LEB 300 MEC 3431-215-15/3
ELECTRODE
TO WORK
SHUNT 400 AMP 50 MV
CURRENT CONTROL REACTOR
WELDING GENERATOR
1 MFD 500V AC/DC 4 PLACE
VOLTAGE CONTROL
REMOTE CONTROL OUTLET
REMOTE CONTROL SW
POLARITY SW
POS ELECT
NEG ELECT
BROWN
BLUE
BLACK
WHITE
TOP
EXCITER
24 VDC GENERATOR
24 VDC REGULATOR
24 VDC POWER RECP
BATTERIES
12 VDC
IDLE CONTROL RELAY
IDLE CONTROL
IDLE CONTROL SW
MAG
MAG SW
LOW OIL PRES SW
HIGH WATER TEMP SW
START SOL
OVERSPEED SHUTDOWN RELAY
ENGINE STARTER
HOLD DOWN TO START SW
START SW
LIGHT SW
PANEL LIGHT
OVERSPEED RESET SW
OIL PRES SW
WELD GEN AMMETER
WELD GEN VOLT METER
AUX GEN AMMETER
AUX GEN VOLT METER
TOTAL TIME METER
SHUNT 50 AMP 50 MV
AUX. OUTLET 115 VDC
1 MFD 500 VAC/DC 2 PLACES
CAP
GRD
OIL PRES GAGE
WATER TEMP GAGE
BAT IND
FUEL LEVEL GAGE
OIL PRES SNDR
WATER TEMP SNDR
FUEL LEVEL SNDR

3 Model LEB 300
Figure 1-4—Continued.

CHAPTER 2

INSTALLATION AND OPERATION INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

2–1. Unloading and Unpacking the Equipment

a. Remove blocking or steel strapping securing the crates or welding machine to the floor of the carrier.

b. Where an overhead hoist or crane with a suitable lifting capacity is available, place slings around each end of the crates and lift the crates from the carrier. If the welding machine is uncrated, attach slings to the two lifting eyes on each end of the skids and lift the welding machine from the carrier. Use spreader bars on the slings to prevent damage to the welding machine.

Warning: **When the welding machine is being hoisted it must be guided by hand lines to prevent swinging which could damage the equipment and injure personnel.**

Warning: **Do not use lifting device with a capacity of less than 2200 pounds. Failure to observe this warning may result in damage to equipment or severe injury or death to personnel.**

c. Where an overhead hoist or crane is not available, either raise the crates or welding machine from the carrier with a fork lift, or construct a ramp of timbers and 2-inch thick boards to the carrier platform. Slide the crates or welding machine down the ramp. Use a heavy snubbing rope or cable during unloading to avoid injury to personnel or damage to equipment.

d. The welding machine may be shipped crated, skidded, or bare. If crated or skidded, remove crating or hold-down devices and lift from base. Unpack any separately packed components and basic issue items.

2–2. Unpacking the Equipment

During unpacking, use care not to damage the equipment.

2–3. Inspecting and Servicing Equipment

Note. Make sure equipment is completely depreserved before servicing. Make sure preservatives have been removed from the crankcase, fuel tank, instrument panel and accessory components.

a. Inspection.

(1) Make a general inspection of entire welding machine. Inspect the packing list to insure that all items have been received. Examine identification plates for positive identification of the equipment.

(2) Inspect welding machine for damaged or defective parts; fuel, water or oil leaks, and defective electrical connections or insulation. Exercise extreme care when inspecting used equipment.

b. Servicing.

(1) Perform quarterly preventive maintenance checks and services as outlined in paragraph 3–6.

(2) Lubricate welding machine in accordance with lubrication order, figure 3–1.

(3) Fill fuel tank with proper fuel. Refer to appendix B, Maintenance and Operating Supplies, for proper grade of fuel.

Warning: **Do not fill fuel tank while engine is running. Fuel spilled on a hot engine may explode and cause injury to personnel.**

Warning: **When filling fuel tank, always provide a metal-to-metal contact between container and fuel tank. This will prevent a static spark from being generated as fuel flows over metallic surfaces.**

(4) Fill cooling system with clean water and an approved corrosion inhibitor. When freezing temperatures are expected, be sure

cooling system contains proper antifreeze mixture.

Note. Refer to table 2-1 for proper antifreeze mixture.

(5) Clean all grease and dirt from welding machine with an approved cleaning solvent.

Warning: **Use only approved cleaning solvents to prevent the possibility of fire or poisoning.**

(6) Fill batteries with electrolyte shipped in separate containers.

Warning: **Do not allow smoking or the use of an open flame in the immediate vicinity while servicing the batteries. Batteries generate hydrogen, a highly explosive gas.**

Warning: **Exercise care at all times while handling electrolyte. When necessary to dilute electrolyte, always pour acid into water. Avoid breathing fumes and do not permit electrolyte to come in contact with skin, wash affected area immediately with baking soda solution or with liberal quantity of water. If electrolyte splashes into eyes, wash immediately with liberal quantity of clean water and obtain medical aid as soon as possible.**

Table 2-1. Freezing Points, Composition, and Specific Gravities of Military Antifreeze Materials

Lowest expected ambient temp. ° F.	*Pints of inhibited glycol per gal. of coolant* [1]	*Compound Antifreeze, Artic* [2]	*Ethylene glycol coolant solution specific gravity at 60° F.* [3]
+20	1½	Issued full strength and ready mixed for 0° to −65° temps.	1.022
+10	2	for both initial installation and replenishment of losses.	1.036
0	2¾	DO NOT DILUTE WITH WATER OR ANY OTHER	1.047
−10	3¼	SUBSTANCE.	1.055
−20	3½		1.062
−30	4		1.067
−40	4¼		1.073
−50	Arctic Anti-freeze pre-ferred		
−60			
−75			

[1] Maximum protection is obtained at 60 percent by volume (4.8 pints of ethylene glycol per gallon of solution).

[2] Military Specification MIL–C–11755 Arctic type, nonvolatile antifreeze compound is intended for use in the cooling system of liquid-cooled internal combustion engines. It is used for protection against freezing primarily in arctic regions where the ambient temperature remains for extended periods close to −40° F. or drops as low as −90° F.

[3] Use an accurate hydrometer. To test hydrometer, use 1 part ethylener glycol antifreeze to 2 parts water. This should produce a hydrometer reading of 0° F.

Note. Fasten a tag near the radiator filler cap indicating the type antifreeze.

2–4. Installation of Separately Packed Components

a. Remote Control Unit.

(1) Remove the remote control unit (fig. 2–1) from the shipping crate.

(2) Blow off the remote control unit with a low pressure air hose.

(3) Place the unit in its correct position (1, fig. 1–3).

(4) Secure the suitcase type clips in order to stabilize the unit.

(5) When in use, the unit is removed from its mounting, plugged into the remote control plug and set at the desired setting.

b. Cables.

(1) Remove the cables (fig. 2–1) from the shipping crate.

(2) Wipe off the cables with a clean rag.

(3) Check the ground and electrode holder connections and tighten if necessary.

(4) Plug in the cables in their correct locations (fig. 2–1).

c. Batteries.

(1) Install batteries in accordance with procedures outlined in paragraph 3–32.

(2) Fill batteries with electrolyte shipped in separate containers.

2–5. Installation or Setting-Up Instructions

a. Location. When possible, locate the welding machine in an area free of dust and moisture. Avoid soft or muddy ground if possible. If it becomes necessary to locate unit on soft ground, arrange a foundation of planks or logs to prevent unit from settling or sinking. The unit should be as level as possible at all times. Whenever possible, position welding machine close to work so that short cables can be used.

b. Indoor Installation. When welding machine is to be installed in an enclosed area, make sure floor of structure is of sufficient strength to support weight of unit. Make sure enclosure is well ventilated with a maximum supply of fresh air available to unit. Install a suitable exhaust pipe extension to carry exhaust fumes outside the enclosure. Install suitable shields for the extension where it passes through flammable walls.

***Warning:* Do not operate arc welding machine in an enclosed area unless exhaust gases are piped to the outside. Inhalation of exhaust fumes will result in serious illness or death.**

c. Ground. The welding set must be grounded prior to operation. The ground can be, in order of preference, an underground metallic water piping system, a driven metal rod, or a buried metal plate. A ground rod must be a minimum diameter of ⅝ inch if solid or ¾ inch if pipe, and must be driven to a minimum depth of 8 feet. A ground plate must have a minimum area of 9 square feet and be buried a minimum depth of 4 feet. The ground lead must be No. 6 AWG (American Wire Gage) copper wire and be bolted or clamped to the rod, plate, or piping system. Connect other end of ground lead to welding set ground terminal stud.

***Warning:* Do not operate welding set until ground terminal stud has been connected to a suitable ground. Electrical faults in the welder set, load lines, or equipment can cause death by electrocution from contact with an underground system.**

2-6. Equipment Conversion

The unit is capable of providing 115 volts of direct current for the operation of lights or small power tools. Refer to paragraph 2-14*c* for instructions to convert the welding machine to a direct current generator.

Section II. MOVEMENT TO A NEW WORKSITE

2-7. Dismantling for Movement

a. Preparation for Movement.

(1) Disconnect welding cables and remote control, if used, (fig. 2-1).

(2) Remove exhaust pipe extension if used.

(3) Close and latch all doors.

(4) Refer to the basic issue items list and make sure that all items listed are on or with the equipment.

b. Short Distance Movement. The welding machine may be towed or skidded for short distances where the terrain permits. Secure a suitable towing device to the tie-down rings on the skid base and tow the unit to a new worksite.

c. Long Distance Movement. The welding machine may be hoisted or skidded on a suitable carrier for movement over long distances.

2-8. Reinstallation After Movement

The welding machine should be installed or setup after movement in accordance with procedures outlined in paragraph 2-5.

Section III. CONTROLS AND INSTRUMENTS

2-9. General

This section describes, locates, illustrates, and furnishes the operator sufficient information about the various controls and instruments for proper operation of the welding machine. Refer to figure 2-2 for Model LE 300; figure 2-3 for Model LEW 300; and figure 2-4 for Model LEB 300.

2-10. Functions

This paragraph describes the functions of the controls and instruments illustrated in figures 2-2, 2-3, and 2-4. Although the nomenclature of the individual controls and instruments may vary slightly, their functions are basically the same.

a. Battery ammeter. Indicates the charging or discharging rate of the battery charging generator.

b. Oil Pressure Gauge. Indicates engine lubricating oil pressure.

c. Water Temperature Gauge. Indicates engine coolant temperature.

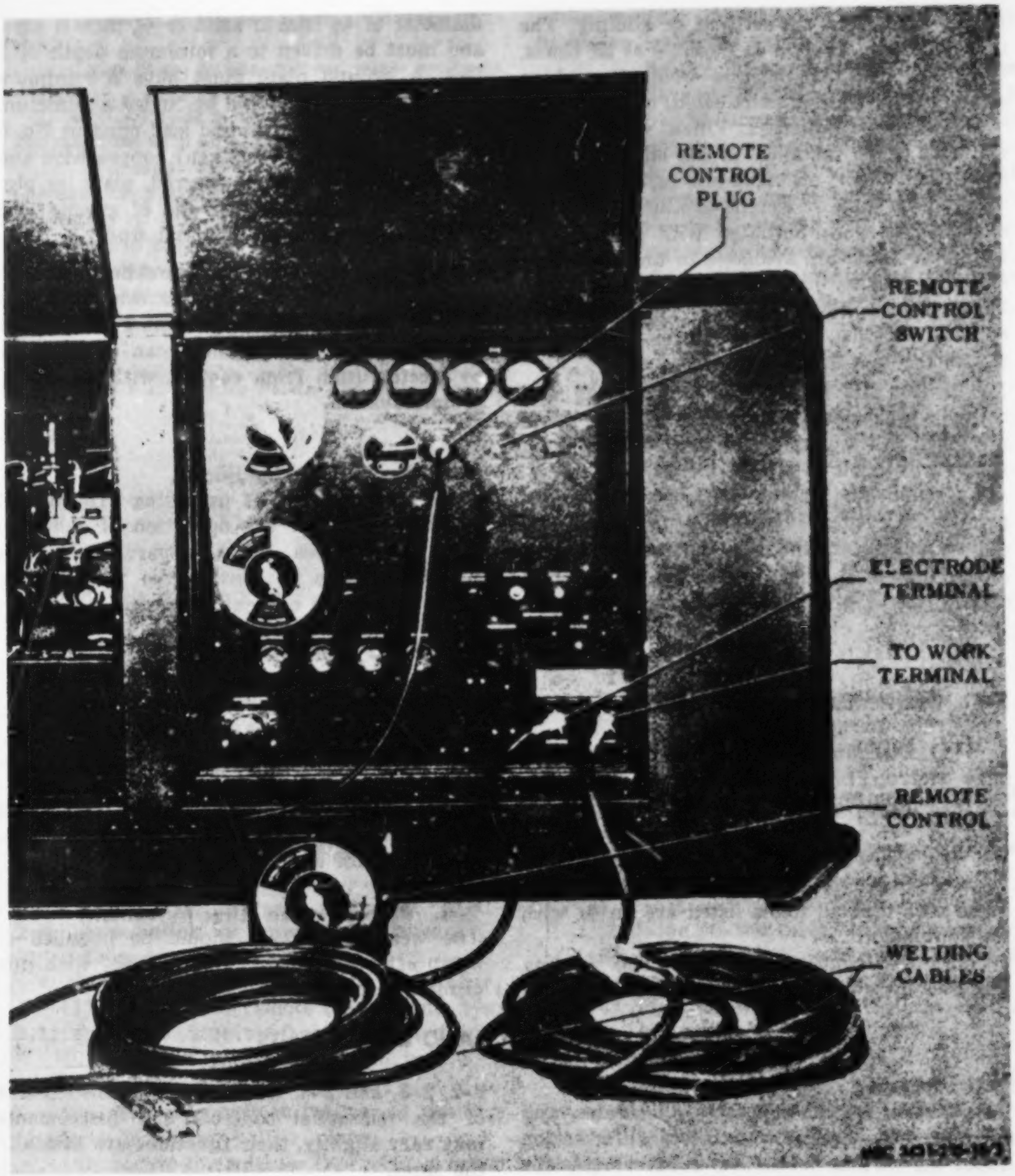

REMOTE CONTROL PLUG
REMOTE-CONTROL SWITCH
ELECTRODE TERMINAL
TO WORK TERMINAL
REMOTE CONTROL
WELDING CABLES

Figure 2–1. Welding cables and remote control.

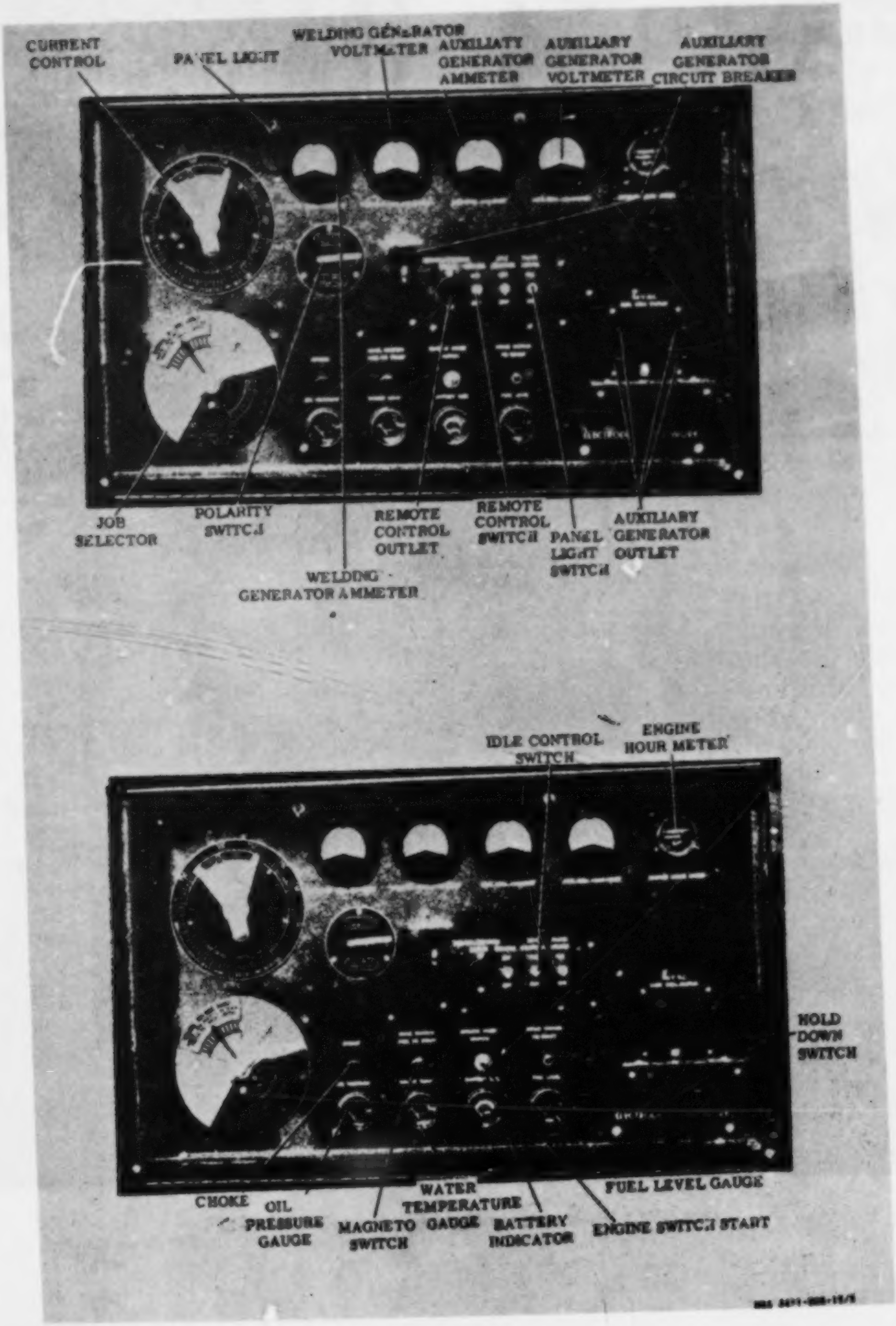

CURRENT CONTROL
PANEL LIGHT
WELDING GENERATOR VOLTMETER
AUXILIARY GENERATOR AMMETER
AUXILIARY GENERATOR VOLTMETER
AUXILIARY GENERATOR CIRCUIT BREAKER
JOB SELECTOR
POLARITY SWITCH
REMOTE CONTROL OUTLET
REMOTE CONTROL SWITCH
PANEL LIGHT SWITCH
AUXILIARY GENERATOR OUTLET
WELDING GENERATOR AMMETER
IDLE CONTROL SWITCH
ENGINE HOUR METER
HOLD DOWN SWITCH
CHOKE
OIL PRESSURE GAUGE
MAGNETO SWITCH
WATER TEMPERATURE GAUGE
BATTERY INDICATOR
FUEL LEVEL GAUGE
ENGINE SWITCH START

Figure 2-2. Controls and instruments (Model LE 300).

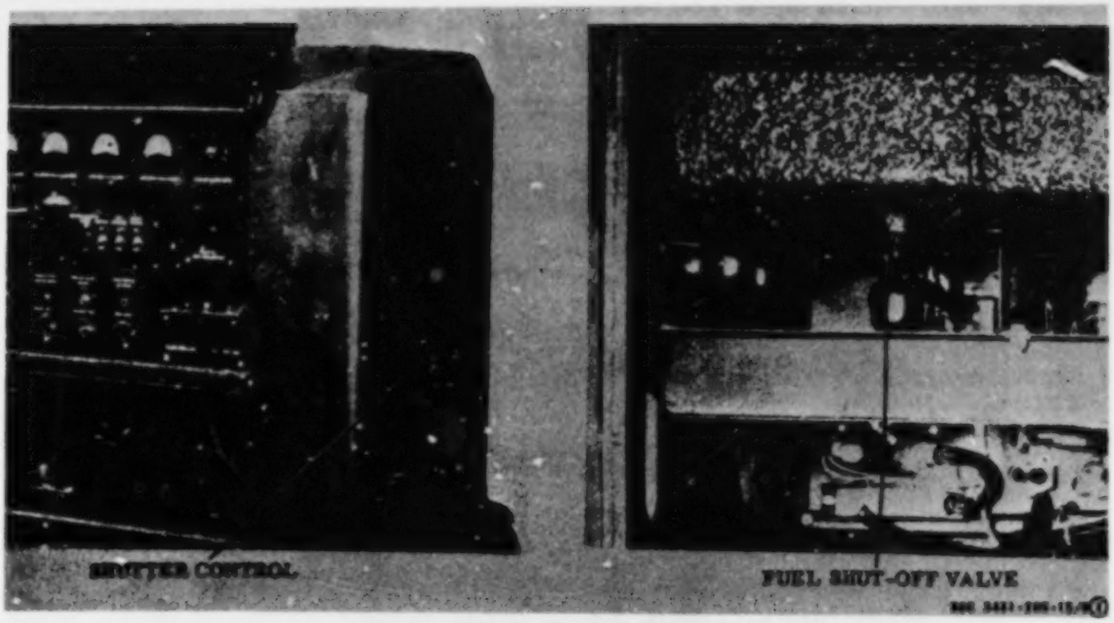

SHUTTER CONTROL
FUEL SHUT-OFF VALVE

Figure 2-2—Continued.

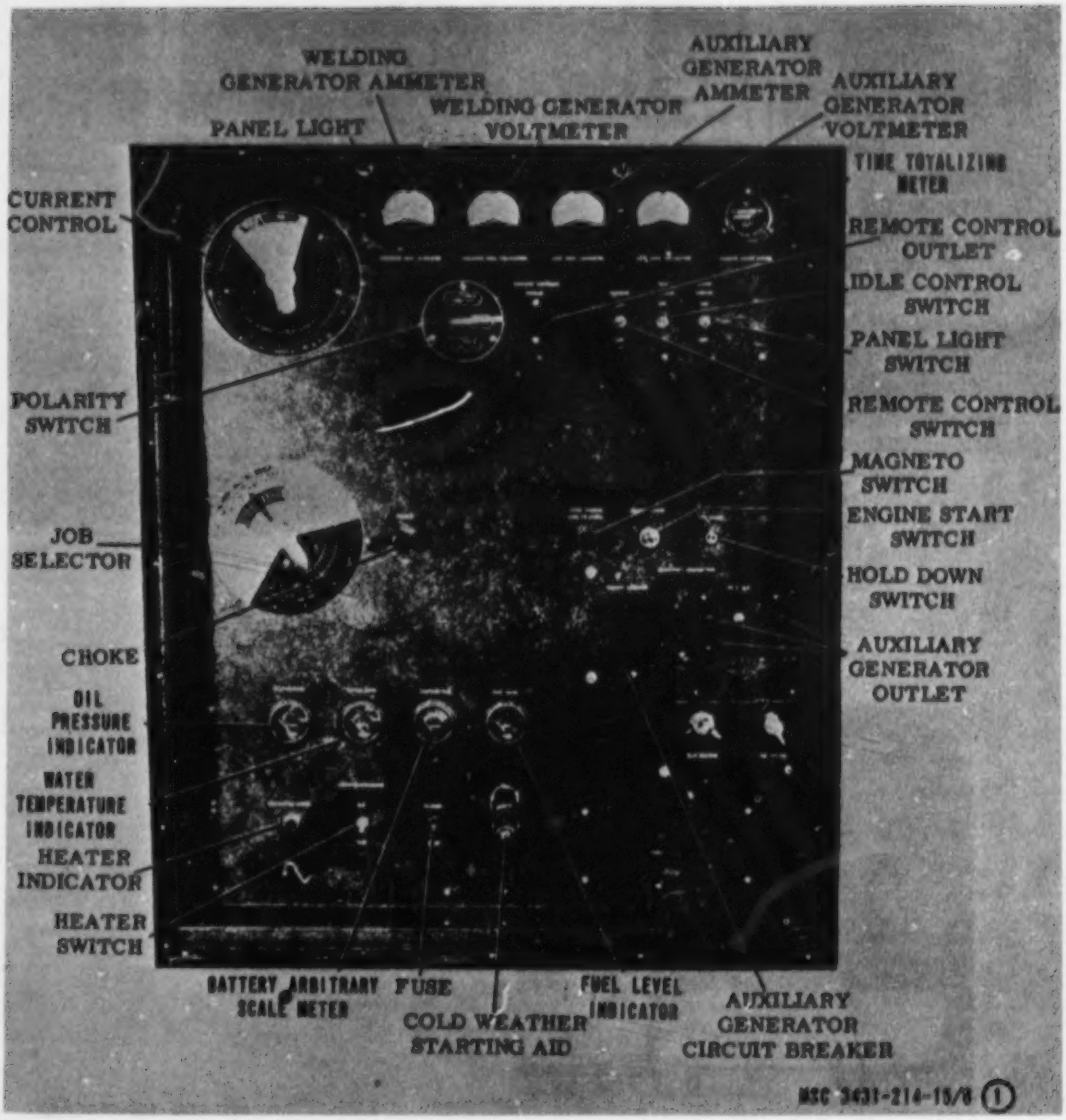

WELDING GENERATOR AMMETER
PANEL LIGHT
WELDING GENERATOR VOLTMETER
AUXILIARY GENERATOR AMMETER
AUXILIARY GENERATOR VOLTMETER
TIME TOTALIZING METER
CURRENT CONTROL
REMOTE CONTROL OUTLET
IDLE CONTROL SWITCH
PANEL LIGHT SWITCH
POLARITY SWITCH
REMOTE CONTROL SWITCH
MAGNETO SWITCH
ENGINE START SWITCH
JOB SELECTOR
HOLD DOWN SWITCH
CHOKE
AUXILIARY GENERATOR OUTLET
OIL PRESSURE INDICATOR
WATER TEMPERATURE INDICATOR
HEATER INDICATOR
HEATER SWITCH
BATTERY ARBITRARY SCALE METER
FUSE
FUEL LEVEL INDICATOR
COLD WEATHER STARTING AID
AUXILIARY GENERATOR CIRCUIT BREAKER
MSC 3431-214-15/8 ①

Figure 2–3. Control and instruments (Model LEW 300).

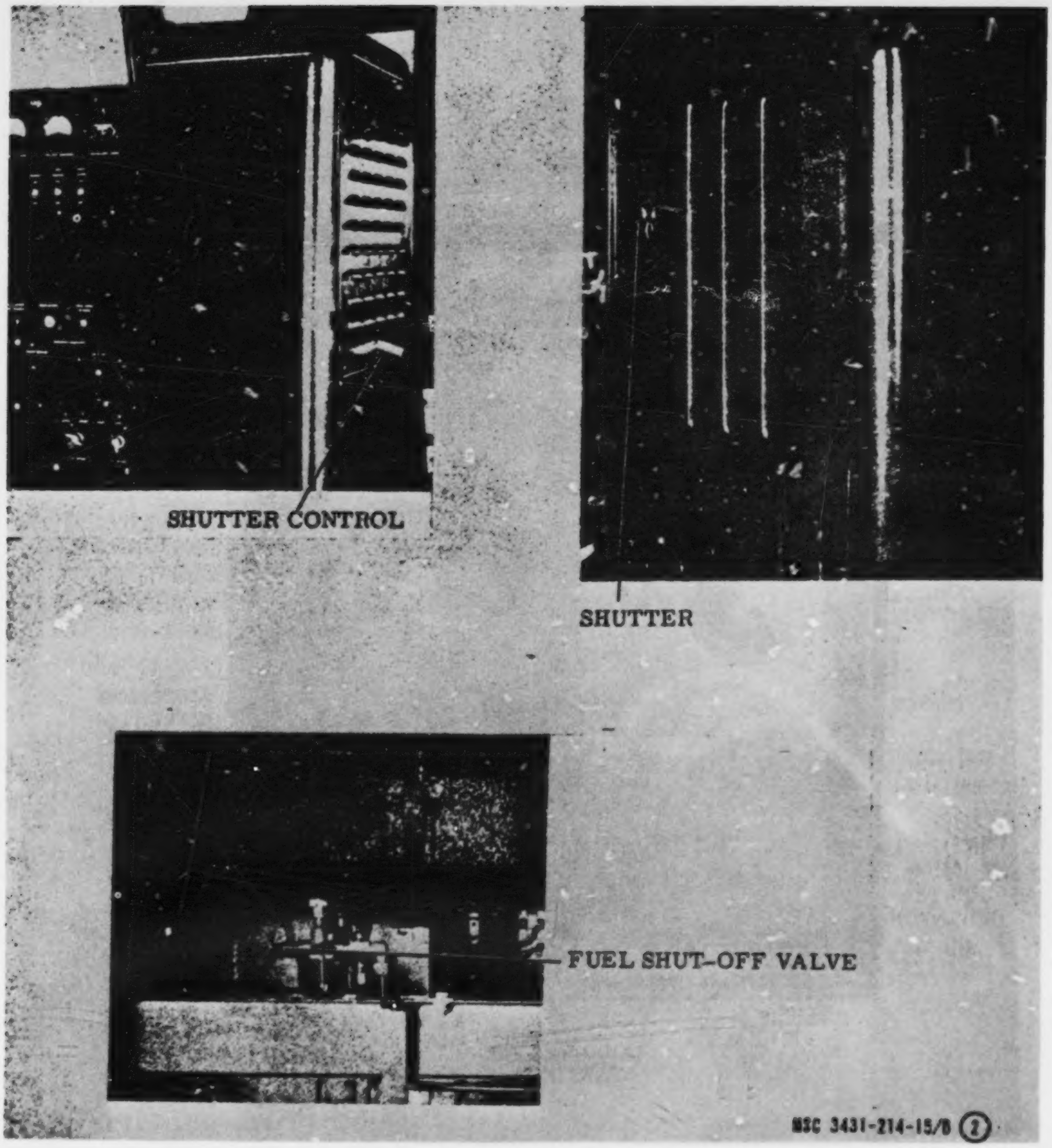

SHUTTER CONTROL
SHUTTER
FUEL SHUT-OFF VALVE
NSC 3431-214-15/8 ②

Figure 2-3—Continued.

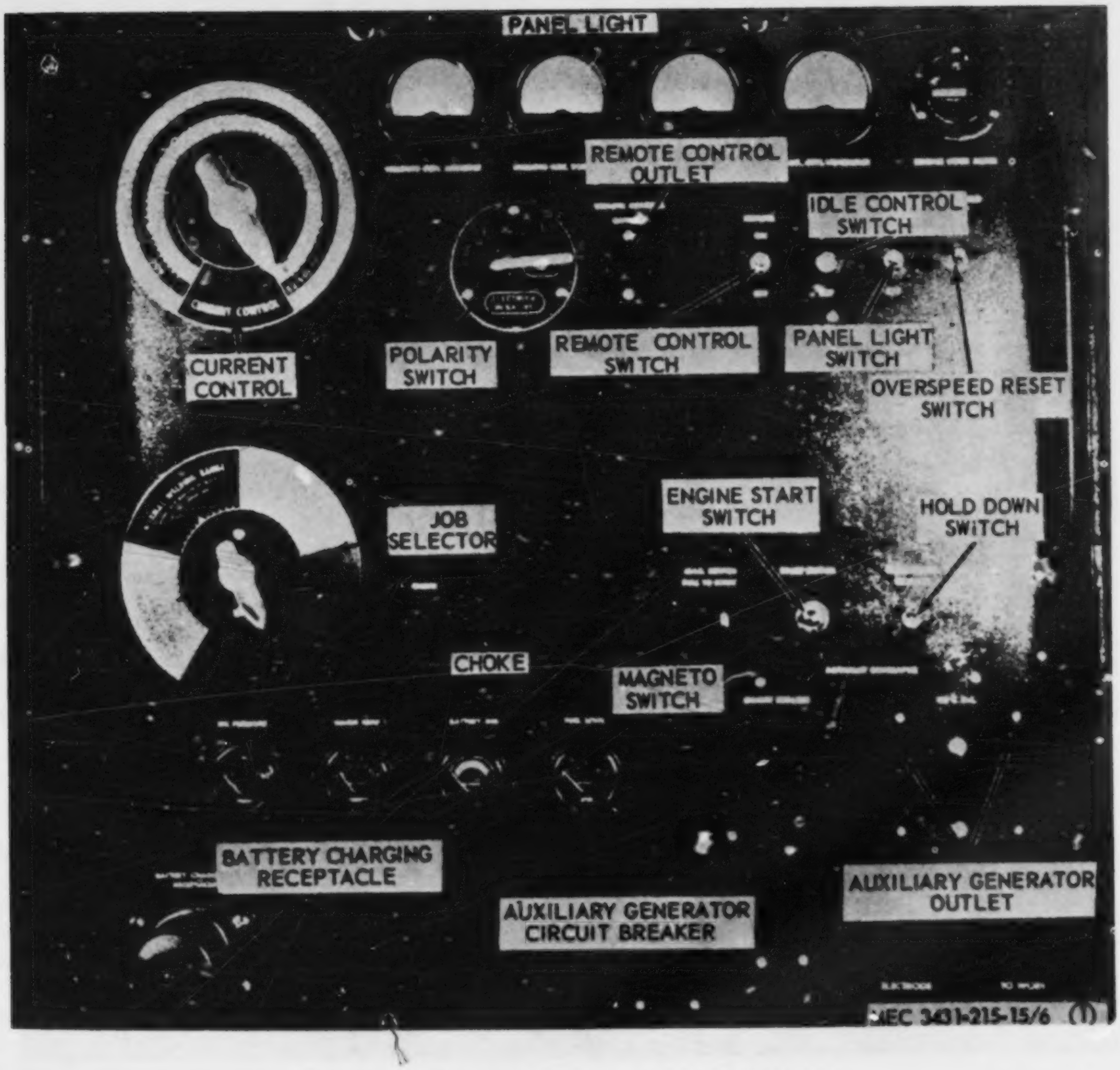

PANEL LIGHT
REMOTE CONTROL OUTLET
IDLE CONTROL SWITCH
CURRENT CONTROL
POLARITY SWITCH
REMOTE CONTROL SWITCH
PANEL LIGHT SWITCH
OVERSPEED RESET SWITCH
JOB SELECTOR
ENGINE START SWITCH
HOLD DOWN SWITCH
CHOKE
MAGNETO SWITCH
BATTERY CHARGING RECEPTACLE
AUXILIARY GENERATOR CIRCUIT BREAKER
AUXILIARY GENERATOR OUTLET
MEC 3431-215-15/6 (1)

Figure 2-4. Controls and instruments (Model LEB 300).

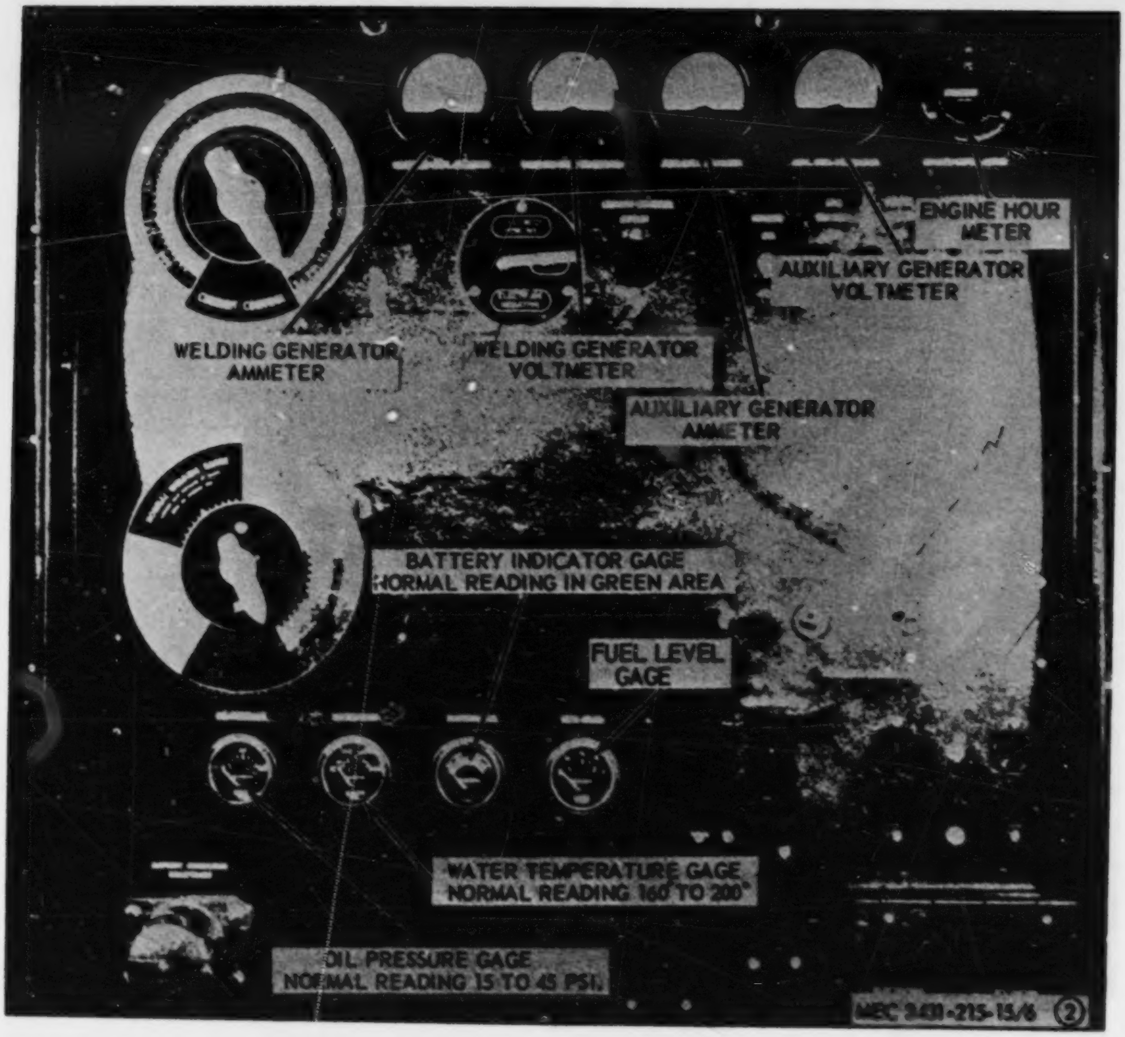

ENGINE HOUR METER
AUXILIARY GENERATOR VOLTMETER
WELDING GENERATOR AMMETER
WELDING GENERATOR VOLTMETER
AUXILIARY GENERATOR AMMETER
BATTERY INDICATOR GAGE NORMAL READING IN GREEN AREA
FUEL LEVEL GAGE
WATER TEMPERATURE GAGE NORMAL READING 160 TO 200°
OIL PRESSURE GAGE NORMAL READING 15 TO 45 PSI.
MEC 3431-215-15/6 ②

Figure 2-4—Continued.

d. Fuel Level Gauge. Indicates the quantity of fuel remaining in the fuel tank.

e. Choke. Restricts the flow of air into the carburetor causing a rich mixture of air and gasoline to facilitate starting the engine.

f. Magneto Switch. Opens the magneto ground, thus, permitting the spark plugs to receive the high current from the magneto. When in the off position, it shorts out the magneto coil and stops the engine.

g. Engine Start Switch. When depressed, completes the circuit from the battery to the starter solenoid, energizing the solenoid which connects battery power to the starter.

h. Hold Down Switch. Disconnects the oil pressure shutdown switch and the water temperature shutdown switch to facilitate starting the engine.

i. Job Selector. Varies the open-circuit voltage of the welding generator.

j. Current Control. Varies the current output of the welding generator.

k. Polarity Switch. Controls the polarity of the electrode. Electrode polarity may be switched from positive to negative as required.

l. Auxiliary Generator Circuit Breaker. Opens or closes the 115 volt dc circuit to the auxiliary outlets.

m. Remote Switch. Switches the control of the open circuit voltage of the welding generator from the current control on the instrument panel to the remote current control.

n. Idle Control Switch. Disconnects the idle control from the circuit to permit engine to operate at governed rpm when using welding generator as an auxiliary power generator.

o. Panel Lights Switch. Opens or closes the 24-volt dc circuit to the instrument panel lights.

p. Welding Generator Ammeter. Indicates the output current of the welding generator.

q. Welding Generator Voltmeter. Indicates the output voltage of the welding generator.

r. Auxiliary Generator Ammeter. Indicates the output current of the auxiliary generator (exciter).

s. Auxiliary Generator Voltmeter. Indicates the output voltage of the auxiliary generator (exciter).

t. Shutter Control. Controls the flow of air through the welding machine enclosure when the side doors are closed.

u. Fuel Shut-Off Valve. Controls the flow of fuel from the tank to the engine carburetor.

v. Elasped Time Meter. Cumulatively indicates the number of operating hours of the engine.

w. Heater Indicator. (Model LEW 300). Indicates when the coolant heater is operating.

x. Heater Switch. (Model LEW 300). Opens or closes the 24 volt dc circuit to the heater.

y. Cold Weather Starting Aid. (Model LEW 300). Contains a capsule of ether that is punctured by pulling the starting aid handle down. This action sprays the ether into the air intake manifold to facilitate quick starting.

Section IV. OPERATION UNDER USUAL CONDITIONS

2–11. General

a. The instructions in this section are published for the information and guidance of the personnel responsible for the operation of the welding machine.

b. The operator must know how to perform every operation of which the welding machine is capable. This section gives instructions on starting, stopping and various operations of the welding machine. Since nearly every job presents a different problem, the operator may have to vary given procedures to fit the individual job.

2–12. Starting

a. Preparation for Starting.

(1) Perform the daily preventive maintenance checks and services in accordance with paragraph 3–6.

(2) Open fuel shut-off valve.

b. Starting the Engine.

(1) Pull out choke knob if necessary to facilitate starting.

(2) Refer to figure 2–5 to start engine.

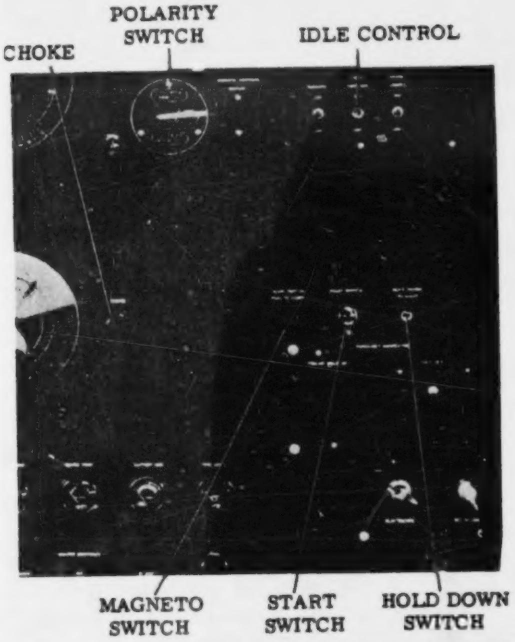
***Caution:* Do not use start switch for more than 30 seconds at a time without allowing two minutes for the motor to cool between cranking periods.**

(3) When engine starts, push choke knob in. If engine stalls, restart engine and push choke knob halfway in. Adjust slowly as engine temperature rises.

Note. Do not operate machine with choke knob pulled out after coolant has reached operating temperature.

(4) After engine has operated for 10 to 20 seconds, check oil pressure gauge for indication of oil pressure.

Caution: **If no oil pressure is indicated after 30 seconds of operation, stop engine and locate source of trouble.**



STEP 1. PLACE POLARITY SWITCH IN " OFF " POSITION.
STEP 2. HOLD HOLD-DOWN-TO-START SWITCH DOWN.
STEP 3. PULL MAGNETO SWITCH OUT.
STEP 4. DEPRESS ENGINE START SWITCH.

MSC 3431-214-15/7

Figure 2-5. Engine starting instructions.

2-13. Stopping

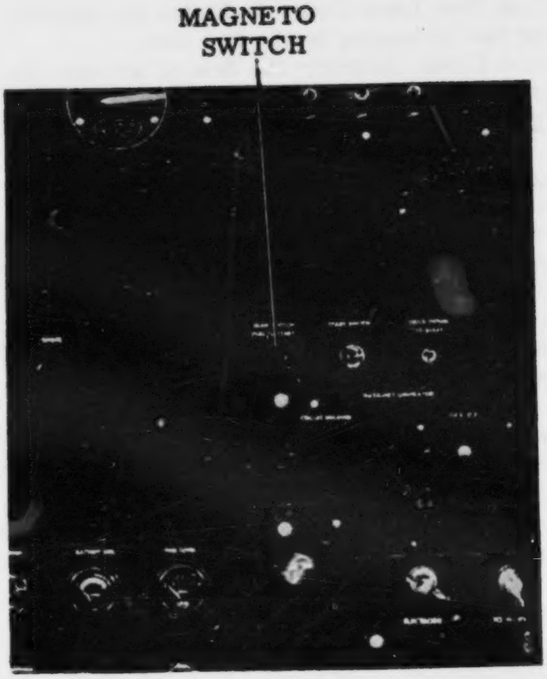
a. Normal Stopping.

(1) Engine idle regulator will automatically return engine to idling speed of about 950 rpm when welding arc is extinguished. Allow engine to idle a few minutes to cool down.

(2) Refer to figure 2-6 to stop engine.

Caution: **Do not pull out choke when stopping engine as raw gasoline will wash lubricant cylinder walls.**

(3) Close fuel shut-off valve below fuel tank.



STEP 1. PUSH MAGNETO SWITCH IN.

MSC 3431-214-15/8

Figure 2-6. Engine stopping instructions.

Warning: **Do not perform any welding operation without a welder's helmet. The flash of the welding arc can cause injury to the eyes.**

2-14. Operation of Equipment

a. Refer to figure 2-7 for normal and auxiliary operation of the equipment.

Note. Use portable job selector for remote work.

b. Welding Methods.

(1) When welding in the vertical and overhead position, the operator should have a strong digging arc for penetration and a cool arc to let molden metal solidify. With job selector set in the red section for a medium-low open-circuit voltage (overhead and vertical setting), the electrode is pulled away, the current will cut down to a lower figure, cooling the puddle and letting the metal solidify. The "in" and "out" motion, combined with normal whipping techniques, gives operator complete control over the puddle during vertical and overhead welding.

(2) When welding down hand or for sheet

metal application, no change of current is desired. During welding for this purpose, job selector should be set in black section for a medium-high open-circuit voltage (normal welding range). Little current change will result from lengthening or shortening arc when job selector is in this position.

(3) When a "rubbery" arc or large electrodes and high currents is desired for welding operation, job selector should be set in the yellow section for a high open-circuit voltage (large electrodes range).

(4) For special jobs requiring the smallest sizes of electrodes and very low current values, job selector should be set in the special applications section for a low open-circuit voltage.

(5) The approximate current range for bare and lightly coated electrodes is shown in table 2-2. Table 2-3 gives similar information for gaseous and slag types of electrodes.

c. Dual Control. Dual control of amperage and voltage can be accomplished by use of job selector and continuous current control. The dual control is utilized by the following steps:

(1) Place polarity switch (fig. 2-2) in the OFF position.

(2) Start engine in accordance with paragraph 2-12 and allow it to warm up.

(3) Place the polarity switch in ELECTRODE POSITIVE or ELECTRODE NEGATIVE as required.

(4) Set job selector (fig. 2-2) to desired voltage.

(5) Set current control (fig. 2-2) to desired amperes.

(6) Strike an arc.

(7) If arc is weak, turn job selector up. If arc is too cold, turn current control up 10 or 20 amperes and turn job selector down.

Warning: **Do not adjust welding controls while maintaining arc.**

(8) If, when correct current is obtained, job selector is positioned beyond desired setting, adjust current control up and return job selector to desired setting, so that necessary arc can be produced.

Table 2-2. Current Setting Range for Bare and Light Coated Electrodes

Electrode diameter (in.)	*Current minimum (amps)*	*Electrode maximum (amps)*	*Lengths (in.)*
3/32	70	90	11 1/2
1/8	110	135	14 or 18
5/32	150	180	14 or 18
3/16	180	220	14 or 18
1/4	250	300	14 or 18
5/16	300	425	14 or 18
3/8	450	550	14 or 18

Table 2-3. Comparison of Current Used With Gaseous and Slag Types of Electrodes

	Gaseous types		
Electrode diameter (in.)	*Flat position (amps.)*	*Vertical and overhead positions (amps.)*	*Slag type flat position (amps.)*
3/32	60	60	
1/8	120	110	130
5/32	150	140	160
3/16	175	160	200
1/4	200		300
5/16	325		400
3/8	425		500

d. Operation as an Arc Welder.

(1) Refer to paragraph 2-12 and start engine.

(2) Connect welding cables to terminals (fig. 2-1).

(3) Place polarity switch in desired position (fig. 2-3).

(4) Place job selector in proper position (fig. 2-3).

(5) Set current control in corresponding color range (fig. 2-3).

e. Operation as a DC Generator.

(1) Refer to paragraph 2-12 and start engine.

(2) Place idle control switch in OFF position (fig. 2-3).

(3) Place auxiliary generator circuit breaker in ON position (fig. 2-3).

Section V. OPERATION UNDER UNUSAL CONDITIONS

2-15. Operation in Extreme Cold (Below 0°F.)

a. Lubricate the engine in accordance with the current lubrication order.

b. Inspect the engine cooling system to assure that it contains the proper mixture of antifreeze. Before adding initial antifreeze, clean and flush the entire cooling system in accordance with paragraph 3-39. Inspect cooling system for signs of leaks or other damage. Inspect shutter control for proper operation.

Caution: **Do not bend or kink coolant**

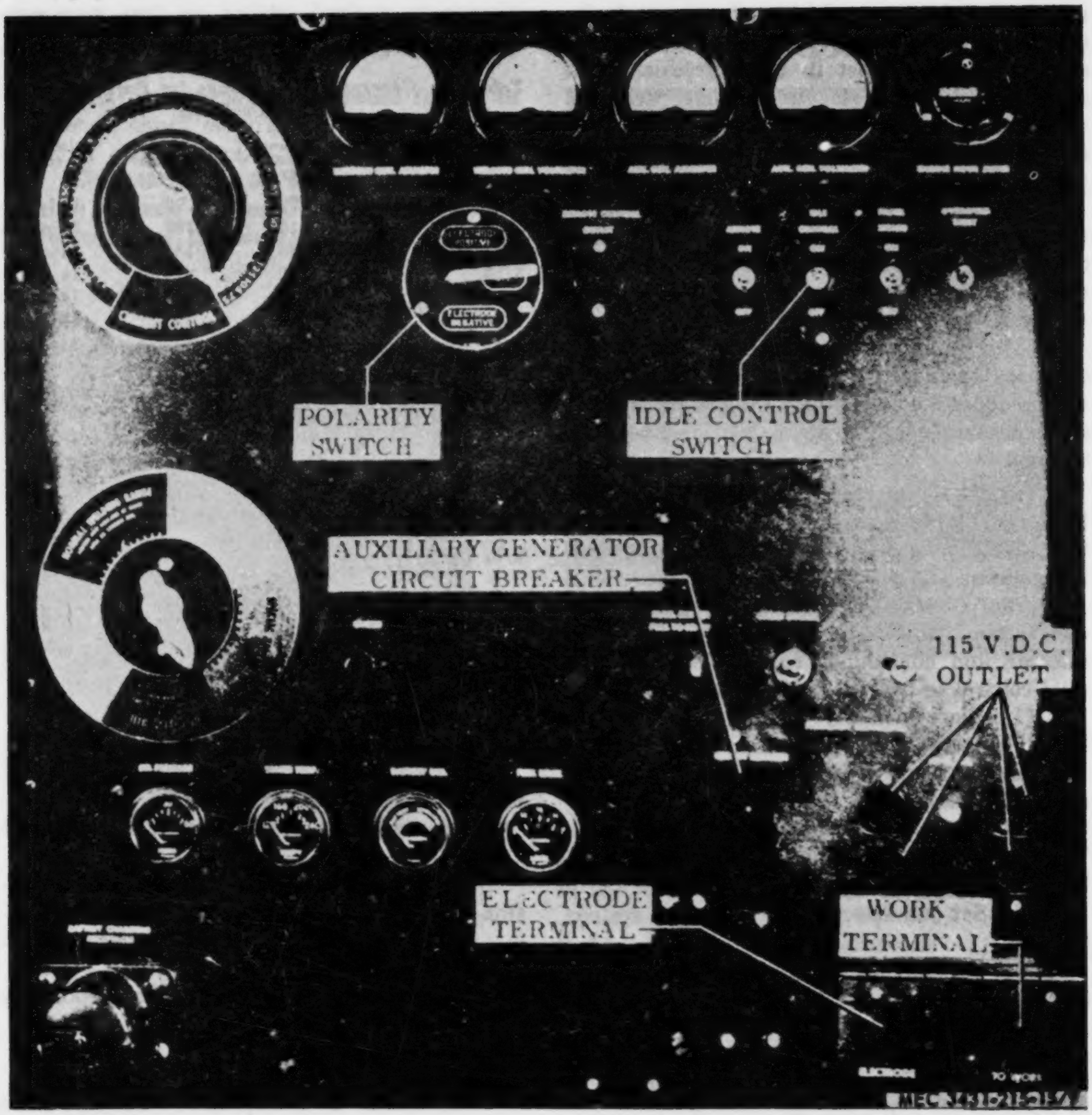

POLARITY SWITCH
IDLE CONTROL SWITCH
AUXILIARY GENERATOR CIRCUIT BREAKER
115 V.D.C. OUTLET
ELECTRODE TERMINAL
WORK TERMINAL

Figure 2–7. Operating instructions.

hoses during cold weather. Rubber hoses will become brittle in extreme cold and break with excessive handling.

c. Keep fuel tank as full as possible at all times to prevent condensation. Any water that forms in fuel tank will be carried to the fuel filter. It may be necessary to drain the fuel filter more frequently than under normal conditions.

d. Before starting engine, wipe the electrical components free of ice and moisture. Do not disturb the wiring as it becomes brittle with extreme cold. See that batteries are fully charged at all times. Table 2–4 gives the electrolyte freezing point for various battery conditions.

***Caution:* Operate the engine for one hour after adding water to the batteries to allow the water to mix with the electrolyte and prevent freezing.**

e. Connect hose from manifold heater to air filter intake.

f. Start coolant heater in accordance with figure 2-8. (Model LEW 300 only).

g. Activate cold weather starting aid (fig. 2-3). (Model LEW 300 only).

h. Start engine in accordance with paragraph 2-12.

i. Close side doors and adjust shutter control to maintain proper engine operating temperature.

2-16. Stopping Engine in Extreme Cold

a. Stop heater in accordance with figure 2-8. (Model LEW 300 only).

b. Stop engine in accordance with paragraph 2-13.

Table 2-4. Battery Condition and Electrolyte Freezing Points

Specific gravity	Battery condition at 80° F.	Freezing points (0° F.)
1.280	Fully charged	−90
1.250	75% charged	−62
1.200	50% charged	−16
1.190	25% charged	−10
1.150	Almost totally discharged	+ 5
1.100	Totally discharged	+19

2-17. Operation in Extreme Heat

a. Keep cooling system free of rust and scale. If necessary add an approved rust inhibitor. Clean and flush the cooling system at frequent intervals. Do not use salt water in cooling system except in extreme emergencies. Make sure the engine thermostat is working properly. Inspect the V-belts for proper adjustments.

b. Lubricate the engine in accordance with the current lubrication order.

c. Do not fill the fuel tank to the top; allow sufficient room for expansion of the fuel.

d. Inspect the electrolyte level of the batteries daily. The electrolyte level should be three-eights inch above the plates. Add water as necessary.

e. Make sure the welding machine is free of airflow restrictions. When operating indoors, make provisions for adequate ventilation and the venting of exhaust fumes to the outside.

f. Start engine in accordance with paragraph 2-12.

g. Close side doors and adjust shutter control to maintain proper engine operating temperature.

h. Begin usual welding operations.

2-18. Operation in Dusty or Sandy Areas

a. When the installation is permanent, erect a protective cover for it. When a temporary installation is made, take advantage of natural barriers whenever possible. All side doors, other than control panel door, should be closed whenever possible during operation. Keep the unit as clean as possible, paying special attention to the engine radiator.

b. In dusty or sandy areas the lubricating filter and air cleaner must be cleaned more frequently than under normal conditions. Clean all lubricating points before and after lubrication. Be sure that all lubricant containers are tightly sealed and stored in an area as free as possible from dust and sand.

c. Start engine in accordance with paragraph 2-12.

d. Close side doors and adjust shutter control to maintain proper engine operating temperature.

e. Begin usual welding operations.

2-19. Operation Under Wet or Humid Conditions

a. When the welding machine is operated outside, erect a shelter to protect the unit when possible. If the erection of a shelter is not practical, keep the machine covered with a canvas. Remove the covering during dry periods, open all doors and allow the unit to dry. Keep the fuel tank as full as possible to prevent the forming of condensation.

b. Start engine in accordance with paragraph 2-12.

c. Close side doors and adjust shutter, control to maintain proper engine operating temperature.

d. Begin usual welding operations.

2-20. Operation in Salt Water Areas

a. Salt water causes corrosive action on metal. Care must be taken to avoid contact of equipment with salt water. If contact is made, or if the unit is exposed to salt spray, wash the unit with clean, fresh water.

Caution: **The cooling system is not de-**

signed to use salt water. However, salt water may be used in an emergency.

b. Coat all exposed polished surfaces with an approved rust proofing material or cover parts with a thin coat of grease. All exposed non-polished surfaces may be coated with a thin layer of grease.

c. Start engine in accordance with paragraph 2-12.

d. Close side doors and adjust shutter control to maintain proper engine operating temperature.

e. Begin usual welding operations.

Section VI. OPERATION OF AUXILIARY MATERIAL USED IN CONJUNCTION WITH WELDING MACHINE

2-21. Fire Extinguisher

a. Description. The monobromotrifluoromethane type fire extinguisher is generally suitable for use on all types of fire, with the exception of fires involving LOX (liquid oxygen) generating equipment. The fire extinguisher is furnished with a disposable-type cylinder.

b. Operation. To operate the fire extinguisher, perform the following operations:

(1) Remove the fire extinguisher from its location.

(2) Break the seal by pulling the safety pin from the handle.

(3) Point the horn at the base of the flame.

(4) Depress the trigger for discharge and direct the stream of content at the base of the fire.

(5) Replace with a new cylinder immediately after using.

c. Replacement of Cylinder. To replace cylinder, perform the following:

(1) Press lever to release pressure from used cylinder.

(2) Loosen swivel valve coupling nut and remove valve assembly from used cylinder.

(3) Remove instruction band from used cylinder.

(4) Place new cylinder through instruction band.

(5) Replace safety pin in valve and seal pin with sealing wire.

(6) Lubricate cylinder neck threads with 1 drop of OE 30 oil before reassembly.

(7) Attach valve assembly and tighten swivel coupling nut on the new cylinder and place fire extinguisher in mounting bracket.

(8) Adjust instruction band on cylinder to show maintenance and operating instructions.

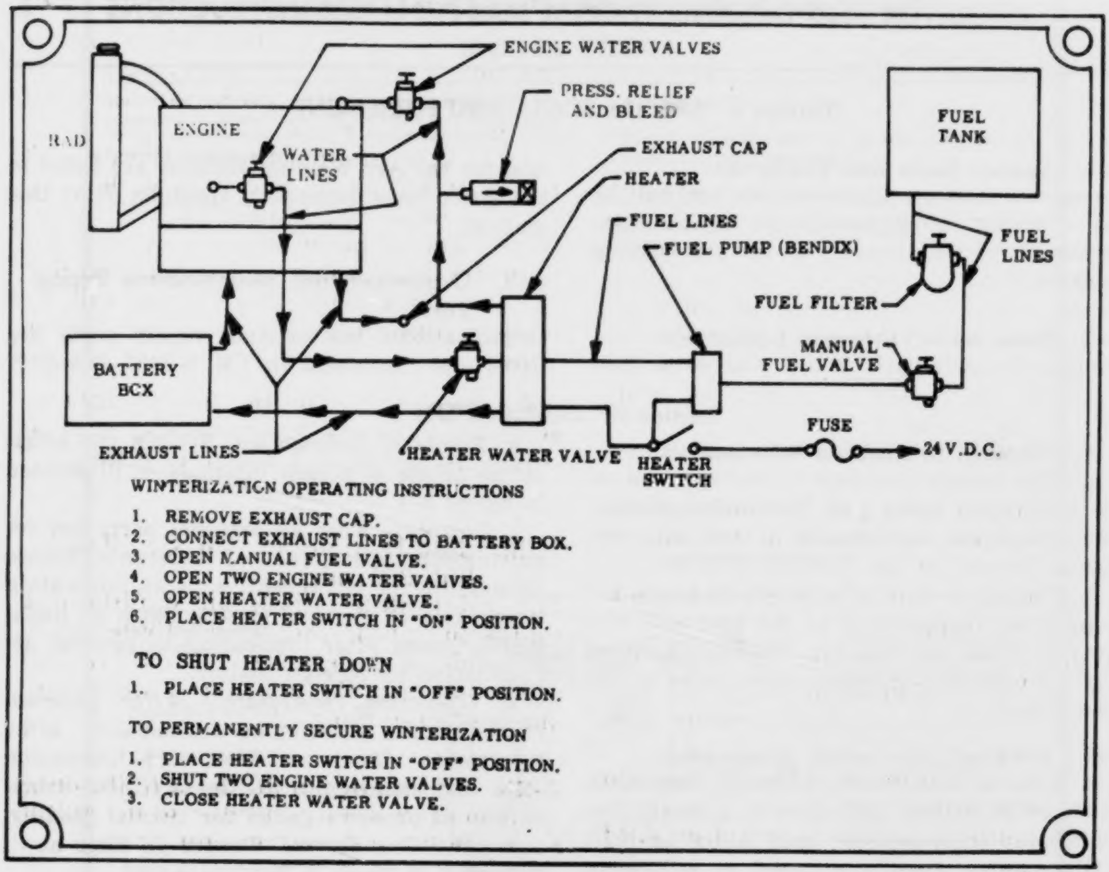
d. Maintenance. Weigh fire extinguisher every 3 months and replace cylinder if gross weight has decreased 4 ounces or more.

2-22. Cold Weather Starting Aid (Model LEW 300 only)

The cold weather starting aid consists of a capsule containing ether. It is activated when the handle is pulled down (fig. 2-3). This action punctures the capsule and sends ether into the intake manifold.

2-23. Coolant Heater (Model LEW 300 only)

Refer to figure 2-8 for operation of the coolant heater during cold weather operation.


ENGINE WATER VALVES
PRESS. RELIEF AND BLEED
RAD
ENGINE
WATER LINES
EXHAUST CAP
HEATER
FUEL LINES
FUEL PUMP (BENDIX)
FUEL TANK
FUEL LINES
FUEL FILTER
MANUAL FUEL VALVE
BATTERY BOX
FUSE
24 V.D.C.
EXHAUST LINES
HEATER WATER VALVE
HEATER SWITCH
MSC 3431-214-15/9 ②

WINTERIZATION OPERATING INSTRUCTIONS

1. REMOVE EXHAUST CAP.
2. CONNECT EXHAUST LINES TO BATTERY BOX.
3. OPEN MANUAL FUEL VALVE.
4. OPEN TWO ENGINE WATER VALVES.
5. OPEN HEATER WATER VALVE.
6. PLACE HEATER SWITCH IN "ON" POSITION.

TO SHUT HEATER DOWN

1. PLACE HEATER SWITCH IN "OFF" POSITION.

TO PERMANENTLY SECURE WINTERIZATION

1. PLACE HEATER SWITCH IN "OFF" POSITION.
2. SHUT TWO ENGINE WATER VALVES.
3. CLOSE HEATER WATER VALVE.

Figure 2–8. Coolant heater operation (Model LEW 300).

CHAPTER 3

OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SPECIAL TOOLS AND EQUIPMENT

3-1. Special Tools and Equipment

No special tools or equipment are required by the operator or organizational maintenance personnel for maintenance of the arc welding machine.

3-2. Basic Issue Tools and Equipment

Tools and repair parts issued with or authorized for the Arc Welding Machine are listed in the Basic issue items list, appendix B of this manual.

3-3. Organizational Maintenance Repair Parts

Organizational maintenance repair parts are listed and illustrated in TM 5-3431-205-20P

Section II. LUBRICATION

3-4. General Lubrication Information

a. This section contains a reproduction of the lubrication order and lubrication instructions which are supplemental to and not specifically covered in the lubrication order.

b. The lubrication order shown in figure 3-1 is an exact reproduction of the approved lubrication order for the Arc Welding Machine. For the current lubrication order, refer to DA Pam 310-4.

3-5. Detailed Lubrication Information

a. Care of Lubricants. Keep all lubricants in closed containers and store in a clean, dry place away from external heat. Allow no dust, dirt, or other foreign material to mix with lubricants. Keep all lubrication equipment clean and ready for use.

b. Points of Lubrication. Service the lubrication points at proper intervals as illustrated in figure 3-1.

c. Cleaning. Keep all external parts not requiring lubrication clean of lubricants. Before lubricating the equipment, wipe all lubrication points free of dirt and grease. Clean all lubrication points after lubricating to prevent accumulation of foreign matter.

d. Operation Immediately After Lubrication. Operate the engine immediately after lubrication. Check oil filter and lubrication lines and connections for leaks. Check lubricating oil pressure gauge for normal reading.

e. Oil Filter Service. Service oil filter as illustrated in figure 3-2.

f. Air Cleaner Service. Service air cleaner as illustrated in figure 3-3.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-6. General

To insure that the welding machine is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance services to be performed are listed and described in table 3-1. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit will be noted for future correction, to be made as soon as operation ceases. Stop operation immediately if a deficiency is noted during operation which would damage the equipment if operation were continued. All deficiencies and shortcomings will be recorded together with the corrective action taken on DA Form 2404 at the earliest possible opportunity.

LUBRICATION

ORDER

L05-3431-205-12

(Supersedes L05-3431-205-15, 14 Aug 1963. L05-3431-214-15, 5 Jan 1964. L05-3431-215-15, 12 Mar 1965)

WELDING MACHINE, ARC: GENERATOR; ENGINE DRIVEN; 300 AMP. (LIBBY MODEL LE-300) (LIBBY MODEL LEW-300) (LIBBY MODEL LEB-300) W/CONTINENTAL ENGINE MODEL FS244

Reference C9100-IL.

Intervals are based on normal hours of operation. Adjust to compensate for abnormal operation and severe conditions. During inactive periods sufficient lubrication must be performed for adequate preservation.

Relubricate after washing.

Clean fittings before lubricating.

Clean parts with SOLVENT, dry-cleaning, or with OIL, fuel, Diesel. Dry before lubricating.

Drain crankcase when hot. Fill and check level.

FOLD FOLD

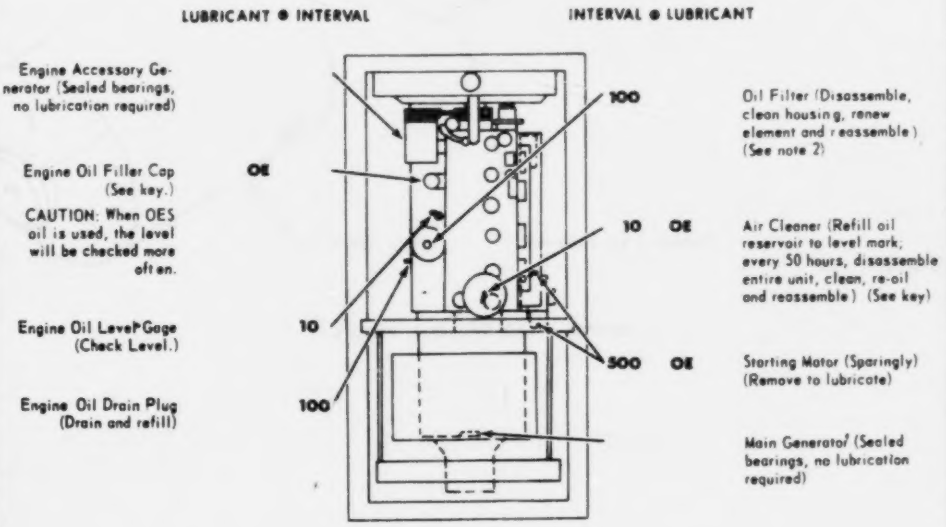

LUBRICANT ● INTERVAL
INTERVAL ● LUBRICANT
Engine Accessory Generator (Sealed bearings, no lubrication required)
Engine Oil Filler Cap (See key.)
OE
CAUTION: When OES oil is used, the level will be checked more often.
Engine Oil Level Gage (Check Level.)
10
Engine Oil Drain Plug (Drain and refill)
100
100
Oil Filter (Disassemble, clean housing, renew element and reassemble) (See note 2)
10
OE
Air Cleaner (Refill oil reservoir to level mark; every 50 hours, disassemble entire unit, clean, re-oil and reassemble) (See key)
500
OE
Starting Motor (Sparingly) (Remove to lubricate)
Main Generator (Sealed bearings, no lubrication required)

Figure 3-1. Lubrication order.

— KEY —

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above +32°F.	+40°F to −10°F	0°F to −65°F	
OE -OIL, Engine, Heavy Duty		**OE** 30	**OE**-10	**OES**	Intervals given are in hours of normal operation.
Crankcase	6 qt				
Air Cleaner	½ qt				
Oil Can Points					
OES -OIL, Engine, Subzero					

NOTES:

1. FOP OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATURES BELOW -10 F°. Remove lubricants prescribed in the key for temperatures above 10 F°. Relubricate with lubricants specified in the key for temperatures below -10°F.

2. OIL FILTERS. Every 100 hours, remove filter elements clean housings; install new elemnets, fill crankcase operate engine 5 minutes, check for leaks, check crankcase oil level and bring to a full mark.

3. OIL CAN POINTS. Every 100 hours lubricate the door hinges, latches, control linkages, and all exposed adjusting threads with OE.

4. LUBRICANTS. The following is a list of lubricants with the Military Symbols and applicable Specification numbers.

OE-MIL-L-2104 OES-MIL-L-10295

Copy of this lubrication order will remain with the equipment at all times; instructions contained herein are mandatory.

BY ORDER OF THE SECRETARY OF THE ARMY:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

OFFICIAL:
KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

FOLD FOLD

Figure 3-1—Continued.

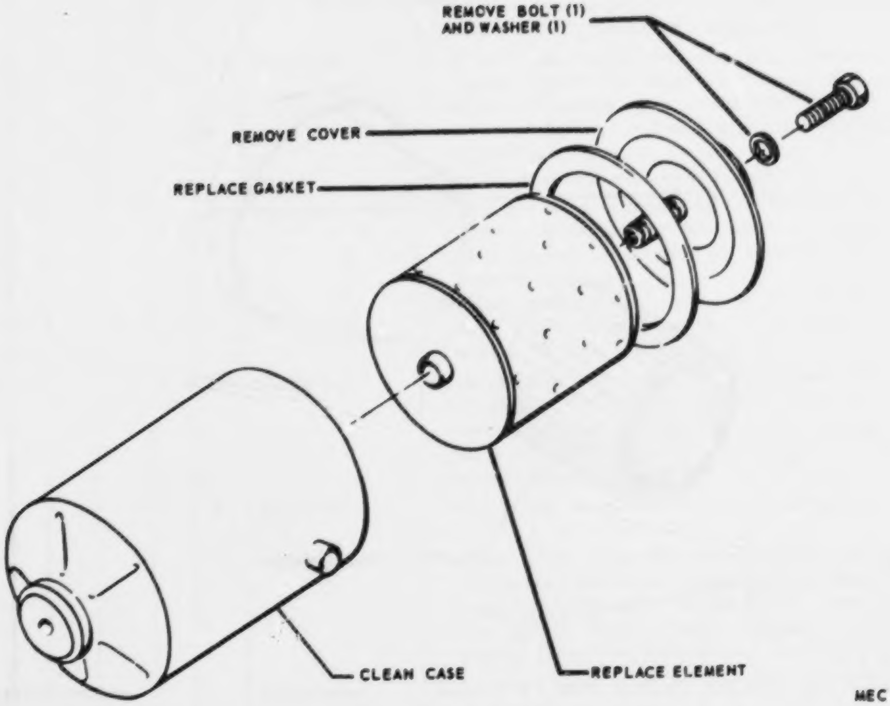
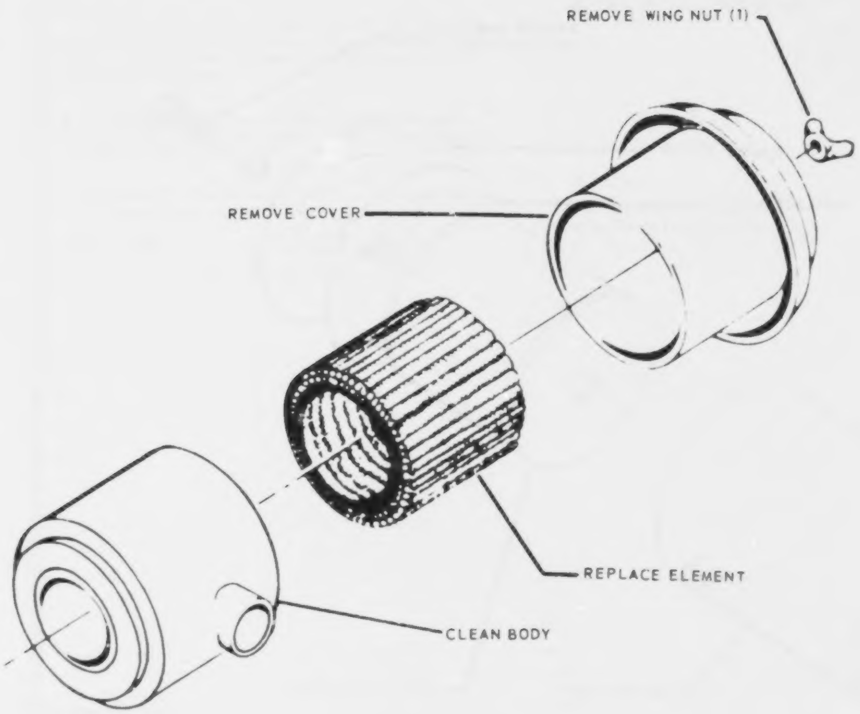

REMOVE BOLT (1)
AND WASHER (1)
REMOVE COVER
REPLACE GASKET
CLEAN CASE
REPLACE ELEMENT
MEC 3431-215-15/11

Figure 3-8. Oil filter service.


REMOVE WING NUT (1)
REMOVE COVER
REPLACE ELEMENT
CLEAN BODY

MEC 3431-215-15/12

Figure 3-3. Air cleaner service.

Table 3-1. Preventive Maintenance Checks and Services

Item number	Interval						B—Before operation D—During operation	A—After operation W—Weekly	M—Monthly Q—Quarterly
	Operator				Org.				
	Daily				M	Q	Item to be inspected	Procedure	Reference
	B	D	A	W					
								Lubricate in accordance with LO.	
1	X						Fuel filter	Clean sediment bowl and screen. Tighten thumbscrew if gasket leaks.	Para 3-9
2	X						Fuel tank	Add fuel as required. Tighten loose mounting. Replace leaking fuel tank. Replace defective cap gasket. Clean cap vent.	Para 3-10
3	X						Oil level gage	Add oil as indicated by level gage.	
4	X					X*	V-Belt	Proper adjustment is a deflection of ⅝ inch midway between crankshaft pulley and generator pulley. *Replace worn, frayed, or cracked belt.	Para 3-11
5				X		X*	Batteries	Tighten loose cables and mounting. Remove corrosion. Inspect for cracks and leaks. Fill to ⅜ above the plates. Clean vent hole in filler cap before installing. In freezing weather run engine 1 hour after adding water. *Replace cracked or leaking battery.	Para 3-32
6	X	X				X*	Main generator	Inspect for insecure mounting and defective wiring. Inspect the armature for rough or dirty surfaces. Inspect the brushes for excessive wear and loose connections. *Replace generator or exciter brushes if they are worn to less than ½ inch. Check brush spring tension. Correct tension is 32 oz.	Para 3-63
7	X					X*	Radiator	Proper coolant is 2 inches below filler neck. Replace cracked or frayed hose. Remove obstructions in the air passages. Tighten all mounting and leaking connections. *Replace defective radiator.	Para 3-39
8						X	Magneto	Check points. Adjust if necessary. Proper gap adjustment is 0.015 inch.	Para 3-33
9						X	Spark plugs	Replace spark plugs that have cracked insulators and burned electrodes. Clean and set spark plug gaps for 0.025 inch. Torque spark plugs to 35 foot pounds. Replace leads which are frayed or broken. Clean and tighten lead connections.	Para 3-35
10	X	X					Carburetor	Inspect for leaks, insecure mounting and improper operation.	Para 3-24
11	X	X				X*	Controls and Instruments	*Replace damaged instruments. Tighten loose mounting. With unit operating, check for proper operation. Normal operating readings for instruments are as follows: Oil pressure gage—30 to 40 psi Temperature gage—150 to 185° F.	Para 3-57

*Indicates organizational function.

3-7. Preventive Maintenance Checks and Services

Table 3-1 contains a tabulated listing of preventive maintenance services which must be performed by the operator. The item numbers are listed consecutively and indicate the sequence of minimum requirements.

Section IV. OPERATOR MAINTENANCE

3–8. General
The instructions in this section are published for the information and guidance of the operator to maintain the Arc Welding Machine.

3–9. Fuel Filter Service
Service fuel filter as illustrated in figure 3–4.

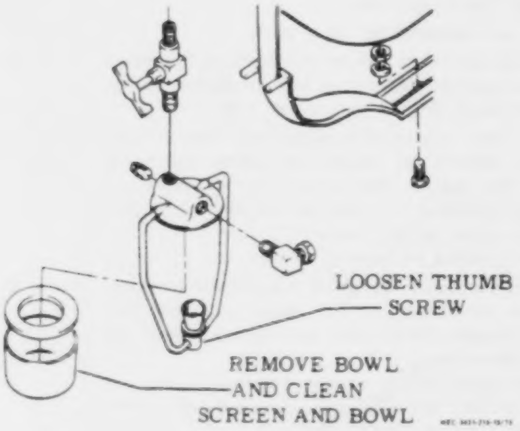


Figure 3–4. Fuel filter service.

3–10. Fuel Tank and Strainer Service
Service fuel tank and strainer as illustrated in figure 3–5.

3–11. Fan V-Belt Adjustment
Adjust fan V-belt as illustrated in figure 3–6.

3–12. Carburetor Adjustment
a. Remove pin from engine idler regulator and manually move idler regulator rod from idle to full load position to establish full range of movement, then set and hold rod at approximately ¼ open throttle.

b. Turn main jet adjustment (fig. 3–7) clockwise until engine speed decreases or engine begins to miss due to lean mixture, then turn screw counterclockwise until engine speeds up and runs smoothly. Release regulator rod.

c. Set idle mixture adjusting needle for smoothest operation of engine with engine idling. If engine cannot be made to idle smoothly, readjust main jet then idle mixture jet until engine runs smoothly at idle speed and can be suddenly advanced to full throttle, without missing.

d. Using tachometer, adjust idle speed adjusting screw for an idle speed of 1000-revolutions per minute (model LEB 300 only). Adjust models LE 300 and LEW 300 for 950 revolutions per minute.

3–13. Lamp Replacement
Replace lamps by removing lamp cover and unscrewing lamp.

Section V. TROUBLESHOOTING

3–14. General
This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the Arc welding machine and its components. Malfunctions which may occur are listed in table 3–2. Each malfunction stated is followed by a list of probable causes of the trouble. The corrective action recommended is described opposite the probable cause.

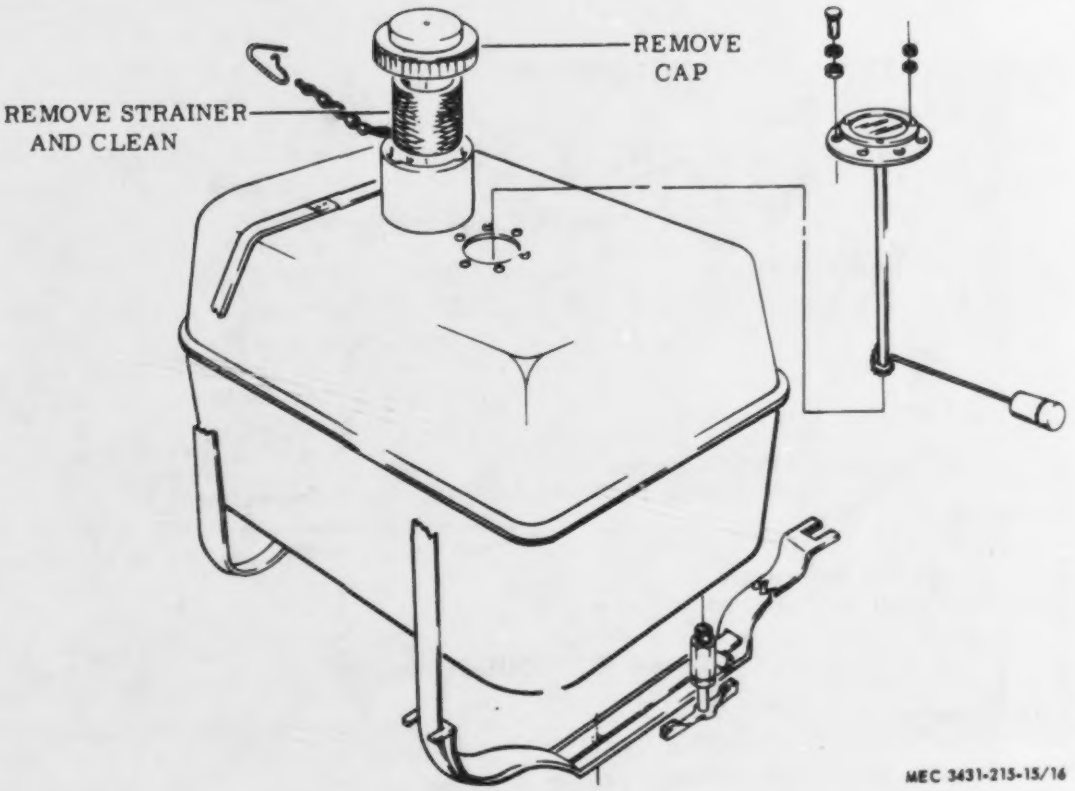

REMOVE CAP
REMOVE STRAINER AND CLEAN
MEC 3431-215-15/16

Figure 3-5. Fuel tank and strainer service.

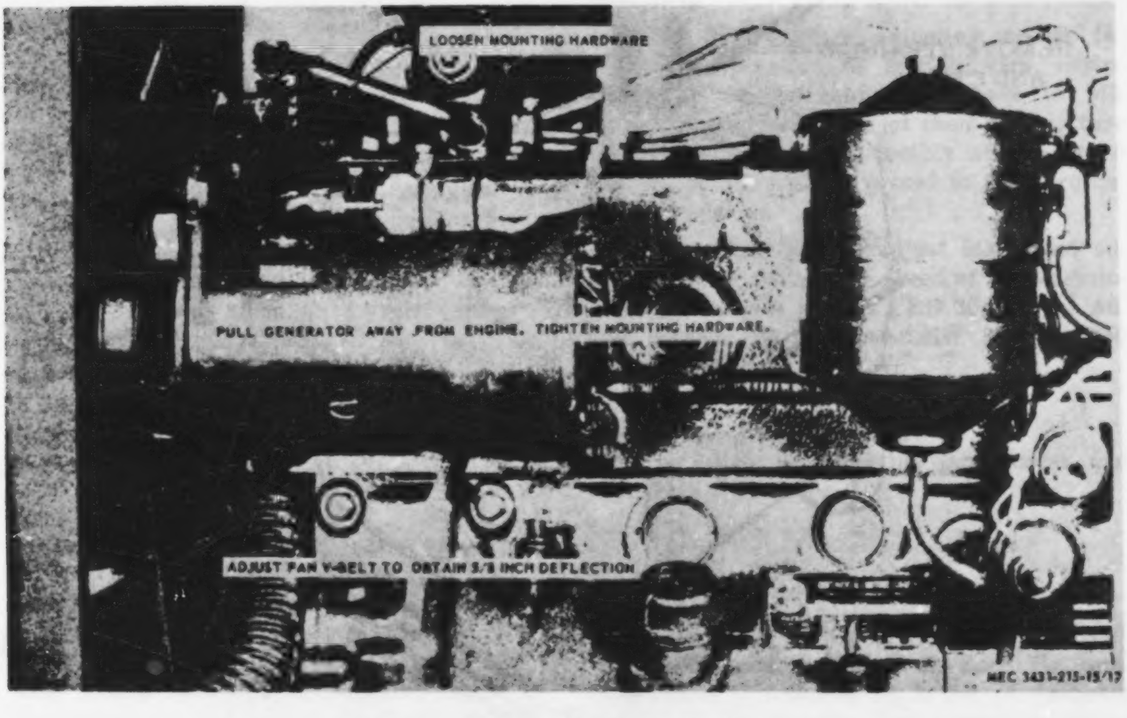
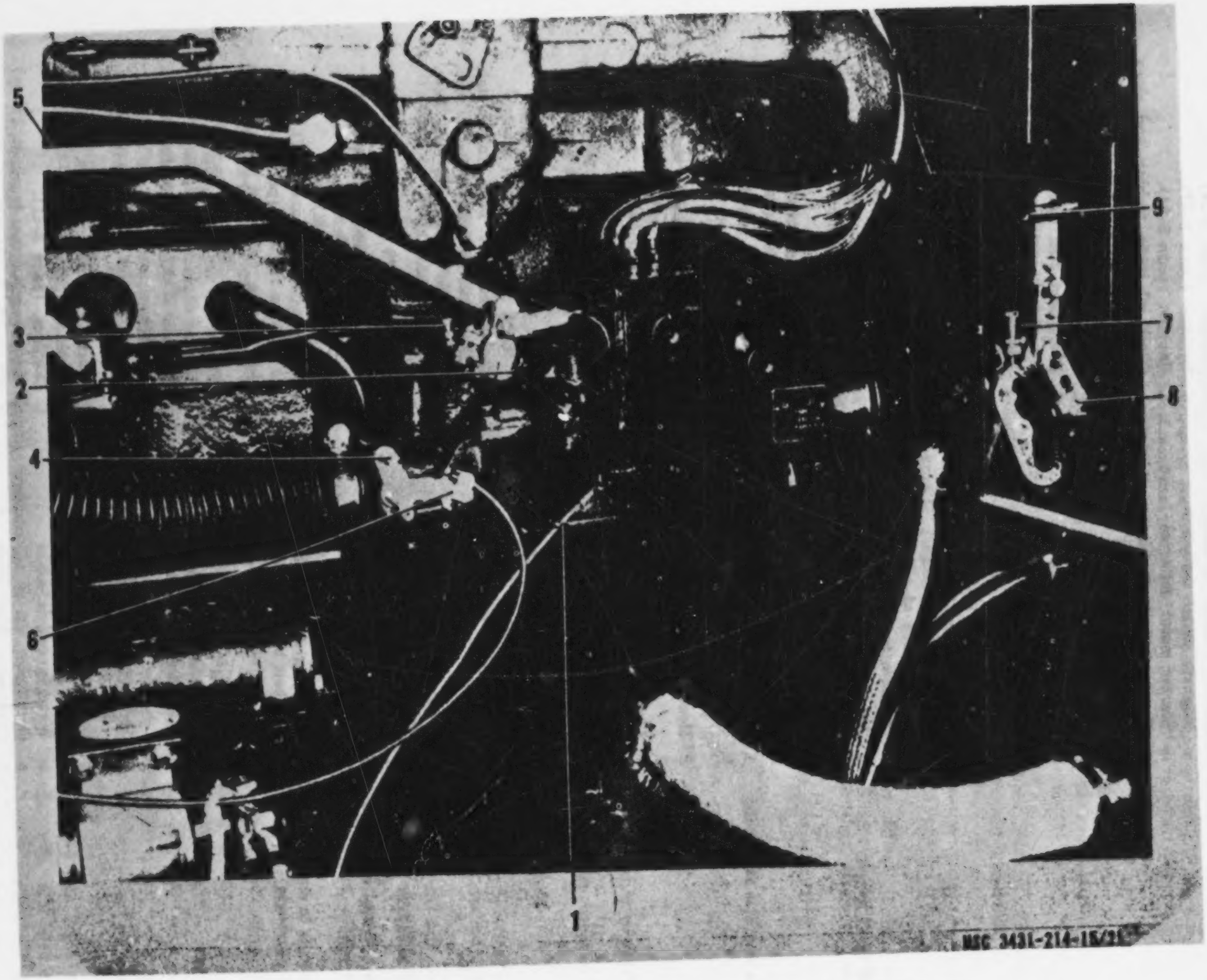

LOOSEN MOUNTING HARDWARE
PULL GENERATOR AWAY FROM ENGINE. TIGHTEN MOUNTING HARDWARE.
ADJUST FAN V-BELT TO OBTAIN 5/8 INCH DEFLECTION
MEC 3431-215-15/17

Figure 3–6. Fan V-belt adjustment.


5
3
2
4
6
1
9
7
8
NSC 3431-214-15/21

1 Main-jet adjustment
2 Idle-adjusting needle
3 Idle-speed adjusting screw
4 Choke-cable lock screw
5 Idling-regulator rod
6 Choke-tube clamp screw
7 Speed-adjusting screw
8 Sensitivity pin
9 Governor rod

Figure 3–7. Carburetor adjustment.

Table 3-2. Troubleshooting

Malfunction	*Probable cause*	*Corrective action*
1. Engine fails to start	a. Battery dead	a. Charge or replace battery. (para 3-32)
	b. Starter solenoid defective	b. Replace. (para 3-34).
	c. Magneto switch defective	c. Replace. (para 3-57).
	d. Starter motor defective	d. Replace. (para 3-34).
	e. Opening wiring or loose or corroded connections.	e. Check all leads, tighten and clean all connections especially on battery cables.
	f. Shut-off valve closed	f. Open valve.
	g. Water in fuel lines	g. Disconnect fuel line at carburetor and drain water out. (para 3-23). Remove fuel filter and clean. (para 3-29).
	h. Plugged vent in fuel cap	h. Clean fuel cap and vent.
	i. Defective fuel pump	i. Replace pump. (para 3-26).
	j. Defective spark plugs	j. Replace. (para 3-35).
	k. Magneto out of adjustment	k. Adjust. (para 3-33).
	l. Magneto condenser shorted	l. Refer to direct support personnel.
2. Engine lacks power	a. Magneto out of adjustment	a. Adjust magneto. (para 3-33).
	b. Restricted fuel system	b. Clean fuel lines and filter. (para 3-29).
	c. Air leak in intake	c. Tighten intake manifold nuts.
	d. Governor out of adjustment	d. Adjust governor. (para 3-28).
3. Engine operates erratically	a. Air leaks in intake	a. Tighten intake manifold nuts.
	b. Spark plugs or leads fouled or loose.	b. Inspect, clean or replace. (para 3-35).
	c. Head gasket leaking	c. Tighten head bolts or replace gasket. (para 3-59).
	d. Carburetor Maladjusted	d. Adjust (para 3-12).
	e. Governor maladjusted	e. Adjust. (para 3-28).
	f. Magneto breaker points pitted.	f. Refer to direct support personnel.
	g. Magneto points burned or incorrectly adjusted.	g. Refer to direct support personnel.
	h. Valve tappets maladjusted	h. Check valve tappet adjustment. (para 3-61).
	i. Water in fuel	i. Check sediment bowl for water. Drain water from sediment bowl and from bottom of fuel tank. (para 3-9).
4. Engine backfires	Carburetor maladjusted	Check adjustment. (para 3-12).
5. Engine becomes noisy	a. Pre-ignition knock	a. Check engine timing. (para 3-33).
	b. Muffler defective	b. Replace. (para 3-55).
	c. Valve lifters out of adjustment	c. Adjust. (para 3-61).
6. Engine fails to stop	Magneto switch or leads open	Repair or replace. (para 3-57).
7. Engine overheats	a. Fan belt broken or slipping	a. Adjust or replace. (para 3-41).
	b. Coolant level low	b. Let engine cool, add coolant and check for leaks.
	c. Oil level low	c. Fill to full mark on gauge.
	d. Engine out of time	d. Retime engine. (para 3-33).
	e. Thermostat defective	e. Inspect, if defective, replace. (para 3-40).
	f. Radiator cooling fins clogged with dirt or insects.	f. Clean radiator core. (para 3-39).
	g. Radiator passages clogged	g. Backflush radiator. (para 3-39).
	h. Hoses deteriorated or collapsing	h. Replace. (para 3-39).
	i. Water pump defective	i. Replace. (para 3-41).
8. Excess fuel consumption	a. Carburetor out of adjustment	a. Adjust carburetor. (para 3-12).
	b. Carburetor float stuck	b. Check float adjustment. (para 3-12).

Table 3-2. Troubleshooting—Continued

Malfunction	*Probable cause*	*Corrective action*
	c. Incorrect engine timing	c. Check timing. (para 3-33).
9. Engine stops suddenly	a. Fuel tank empty	a. Fill fuel tank.
	b. Fuel cap vent plugged	b. Clean vent.
	c. Restriction in fuel line	c. Clean or replace. (para 3-23).
	d. Magneto condenser shorted	d. Refer to direct support personnel.
10. Engine surges	a. Governor spring tension wrong	a. Refer to direct support personnel.
	b. Governor worn	b. Replace. (para 3-28).
11. Oil Pressure too low	a. Oil quantity low	a. Check oil quantity.
	b. Wrong grade of oil	b. Use proper grade of oil (para 3-4).
	c. Gauge defective	c. Check against gauge know to be accurate.
12. High oil consumption	a. Wrong grade of oil	a. Use proper grade of oil (para 3-4).
	b. Gauge defective	b. Check against gauge known to be accurate.
	c. Clogged oil breather	c. Clean breather (para. 3-60).
13. Ammeter shows no charge or continuous discharge.	a. Voltage regulator defective	a. Replace, (para 3-37).
	b. Fan belt broken or slipping	b. Adjust or replace. (para 3-41).
	c. Short in engine electrical system	c. Inspect leads and components.
	d. Generator defective	d. Check brushes. Replace. (para 3-36).
14. Ammeter continuously charges.	a. Regulator defective	a. Replace. (para 3-37).
	b. Battery excessively discharged	b. Charge or replace battery. (para 3-32).
	c. Battery shorted internally	c. Replace. (para 3-32).
15. Welding Generator output voltage low.	a. Wiring shorted	a. Repair or replace.
	b. Commutator dirty	b. Clean.
	c. Brush-spring pressure low	c. Adjust, or replace brushes. (para 3-64).
	d. Brushes sticking in holders	d. Repair or replace brushes. (para 3-64).
16. Welding current fails or becomes low.	a. Defective welding cable, electrode holder, or ground clamp.	a. Repair or replace.
	b. Defective wiring or connections	b. Repair or replace defective parts.
17. Welding arc becomes noisy and spatters excessively.	Current setting too high	Adjust setting to desired current.
18. Welding arc sluggish.	a. Current too low	a. Adjust setting to desired current.
	b. Poor connections	b. Inspect, clean, and tighten poor connections.
19. Electrode holder becomes hot.	Cable connections dirty or corroded	Clean and tighten.

Section VI. RADIO INTERFERENCE SUPPRESSION

3-15. General Methods Used to Attain Proper Suppression

Essentially, suppression is attained by providing a low resistance path to ground for stray currents. The methods used include shielding the ignition and high frequency wires, grounding the frame with bonding straps, and using capacitors and resistors.

3-16. Interference Suppression Components

There are two CA-480 series, 0.1 μf, 500 volt AC/DC capacitors which bypass the pair of 115-VDC convenience outlets to the control panel. The capacitors are bonded with three internal-external tooth lockwashers. There are four CA-488 series, 0.1 μf, 500 volt AC/DC capacitors which bypass the four welding generator brush holders to the generator frame. Each capacitor is bonded with one tooth-type lockwasher, under the head and nut of the mounting screw. In addition to these capacitors, there are two CA-480 series, 0.1 μf, 500 volt AC/DC capacitors which bypass the two exciter brush holders to the exciter frames.

The capacitors are bonded with the two tooth-type lockwashers. There are two tinned copper braided bond straps. One bonds the control panel to the load spring with six tooth-type lockwashers. The other bond strap bonds the engine to the skid base with four tooth-type lockwashers. The lockwashers are placed at each side and at each end of the bond straps. There are several tooth-type lockwashers other than the ones mentioned. Two tooth-type lockwashers bond the magneto, two bond ends of battery charging generator to the generator mounting bracket, two bond the generator mounting bracket to the engine block, two at each mounting bolt bond the regulator to the skid, two bond the regulator to the skid, two bond the exciter cover to the exciter frame, two bond the welding generator to the skid base, and two tooth-type lockwashers bond the hood to the skid base. The charging system armature and field leads, between the generator and regulator are enclosed in common tinned copper braid shielding, terminated at each end with pigtail connections and pressure clamps. The pressure clamps are bonded to threaded fittings with tooth-type lockwashers.

3–17. Replacement of Suppression Components

a. Removal of Capacitors.

(1) Unsolder capacitor leads.

(2) Remove the capacitor.

(3) Remove the tooth-type lockwashers.

b. Removal of Bond Straps.

(1) Remove screws, nuts and tooth-type lockwashers which hold bond straps.

(2) Remove the bond straps.

c. Removal of Tooth-Type Lockwashers.

(1) Remove nut which holds tooth-type lockwashers into position.

(2) Remove tooth-type lockwasher.

d. Removal of Shielding.

(1) Remove pressure clamps and tooth-type lockwashers.

(2) Remove shielding.

e. Replacements of Components. Replace capacitors, bonding straps, tooth-type lockwashers, and shielding in reverse order of the removal process.

3–18. Testing of Radio Interference Suppression Components

Test the capacitors for leaks and shorts on a capacitor tester; replace defective capacitors. If test equipment is not available and interference is indicated, isolate the cause of interference by the trial-and-error method of replacing each capacitor in turn until the cause of interference is located and eliminated.

Section VII. ORGANIZATIONAL MAINTENANCE PROCEDURES

3–19. General

The following sections of this chapter will provide repair instructions for all items which are the responsibility of organizational maintenance as allocated on the maintenance allocation chart.

Section VIII. DOORS AND PANELS

3–20. General

The engine and generator are enclosed in a sheet metal housing. Doors at both sides of the unit provide access to welding machine components. Sheet metal panels and hood complete the housing assembly.

3–21. Doors and Panel

a. Removal.

(1) Remove batteries (para 3–32).

(2) Remove and disassemble doors and panels as illustrated in figure 3–8.

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect for cracks, breaks, or other damage. Replace all defective parts.

c. Installation.

(1) Refer to figure 3–8 and reassemble and install doors and panels.

(2) Install batteries (para 3–32).

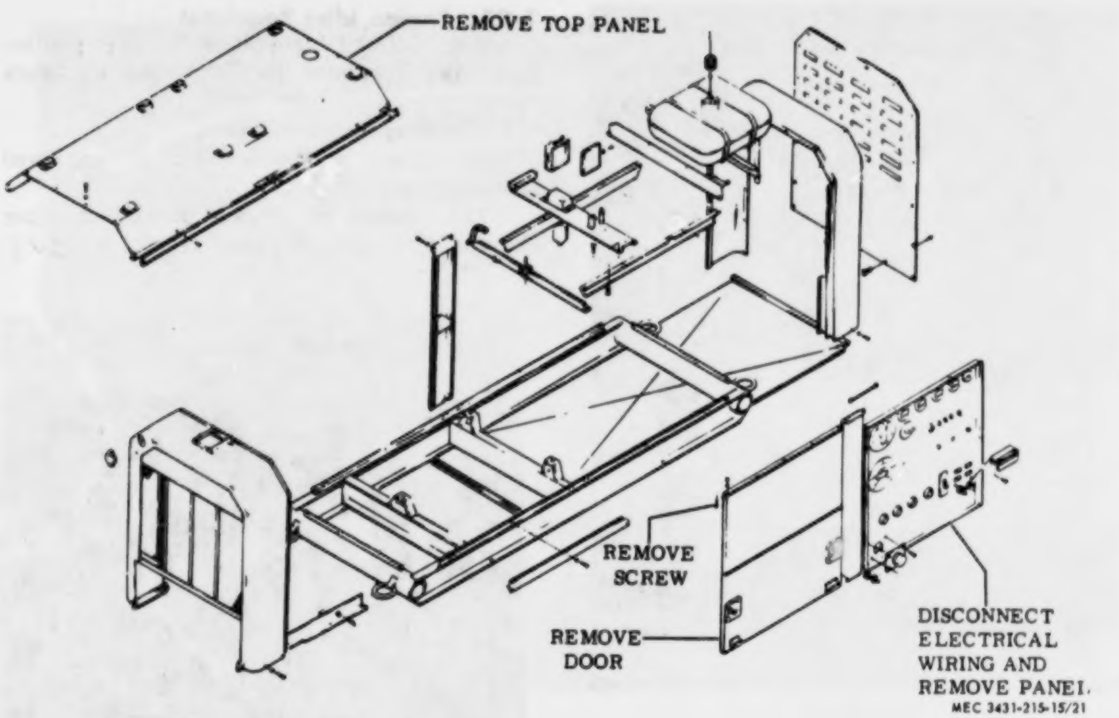


Figure 3–8. Doors and panel, removal and installation.

Section IX. FUEL SYSTEM

3–22. General

The engine fuel system consists of a fuel tank, carburetor, fuel pump, air cleaner, engine speed governor, fuel filter, choke control, shut-off valve, lines, and fittings.

3–23. Fuel Tank, Lines and Fittings

a. Removal.

(1) Drain fuel tank by connecting hose to the drain cock and opening valve.

(2) Remove door (para 3–21).

(3) Refer to figure 3–9 and remove fuel tank, lines and fittings.

b. Cleaning and Inspection.

(1) Clean fuel tank with live steam and dry thoroughly.

(2) Inspect all parts for cracks, breaks, and other damage.

(3) Replace all damaged or defective parts.

c. Installation.

(1) Refer to figure 3–9 and install fuel tank, lines and fittings.

(2) Install door (para 3–21).

(3) Fill fuel tank (para 2–3).

3–24. Carburetor

a. Removal and Installation. Remove and install carburetor as illustrated in figure 3–10.

b. Cleaning and Inspection.

(1) Unscrew and remove filter head, then remove washer and filter element.

(2) Remove four screws and lockwasher assemblies, then carefully separate throttle body assembly from fuel bowl body and loosen gasket from bowl. Lift throttle body from fuel bowl, carefully avoiding damaging float assembly. Remove gasket.

(3) Wrap tip of air hose with cloth to protect against scratching and blow out all jets using low air pressure and reversing air flow from normal direction of fuel flow.

(4) Inspect for cracks, breaks, or other damage. Replace a damaged carburetor.

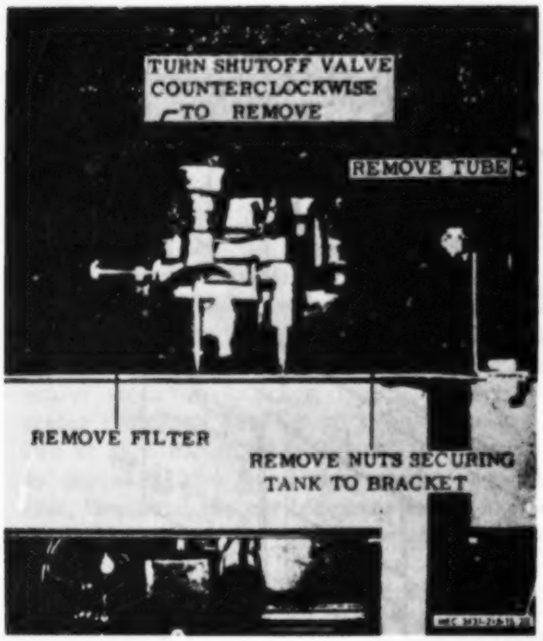

TURN SHUTOFF VALVE
COUNTERCLOCKWISE
TO REMOVE
REMOVE TUBE
REMOVE FILTER
REMOVE NUTS SECURING
TANK TO BRACKET

Figure 3-9. Fuel tank and shut-off valve, removal and installation.

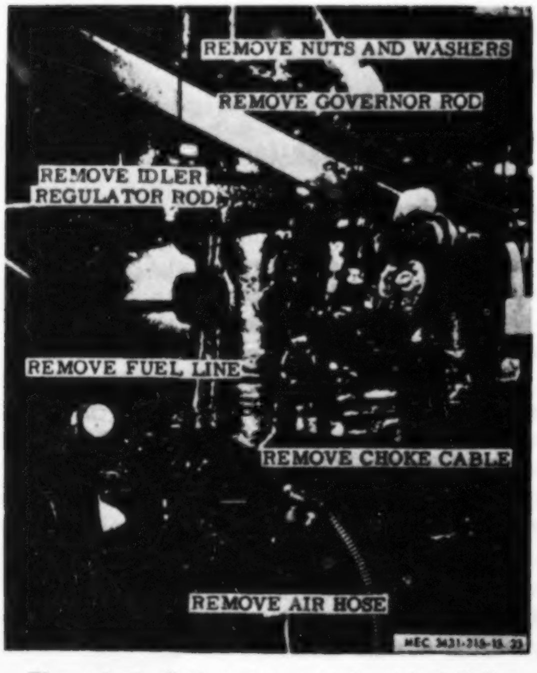

REMOVE NUTS AND WASHERS
REMOVE GOVERNOR ROD
REMOVE IDLER
REGULATOR ROD
REMOVE FUEL LINE
REMOVE CHOKE CABLE
REMOVE AIR HOSE
MEC 3431-215-15/23

Figure 3-10. Carburetor, removal and installation.

c. Adjustment. Adjust carburetor in accordance with porcedure outlined in paragraph 3-12.

3-25. Engine Idler Regulator

a. Removal and Installation. Remove and install idler regulator as illustrated in figure 3-11.

b. Cleaning and Inspection.

(1) Clean all parts with an approved solvent.

(2) Inspect for cracks, breaks, or other damage. Replace a damaged regulator.

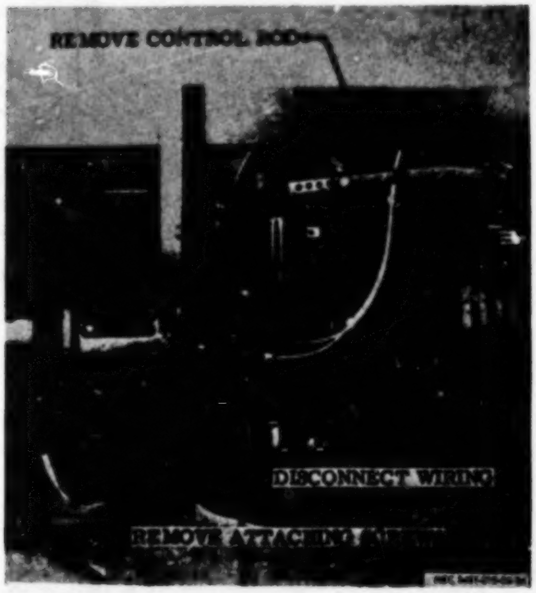

REMOVE CONTROL ROD
DISCONNECT WIRING
REMOVE ATTACHING

Figure 3-11. Idler regulator, removal and installation.

3-26. Fuel Pump

a. Removal and Installation. Remove and install fuel pump as shown in figure 3-12.

b. Cleaning and Inspection.

(1) Clean all parts with an approved solvent. Dry thoroughly.

(2) Inspect all parts for cracks, breaks, or other damage. Replace defective fuel pump.

3-27. Air Cleaner

a. Removal. Remove air cleaner as shown in figure 3-13.

b. Cleaning and Inspection.

(1) Clean all parts with an approved solvent. Dry thoroughly.

(2) Inspect all parts for cracks, breaks, or other damage. Replace a damaged air cleaner.

c. Installation. Install air cleaner as shown

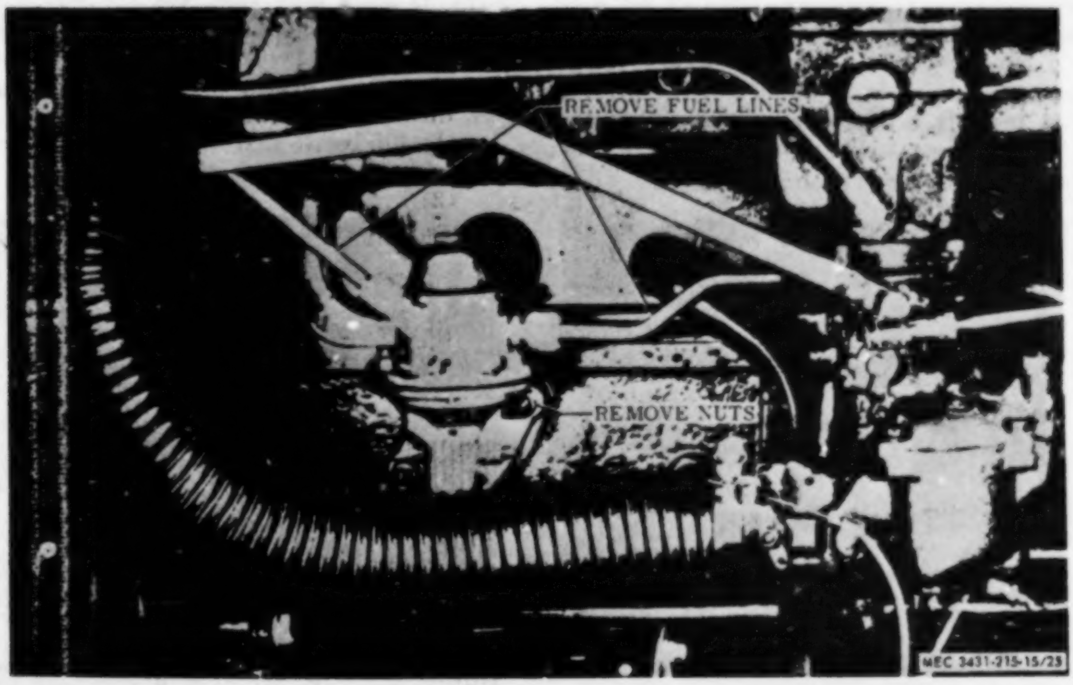

REMOVE FUEL LINES
REMOVE NUTS
MEC 3431-215-15/23

Figure 3-12. Fuel pump, removal and installation.

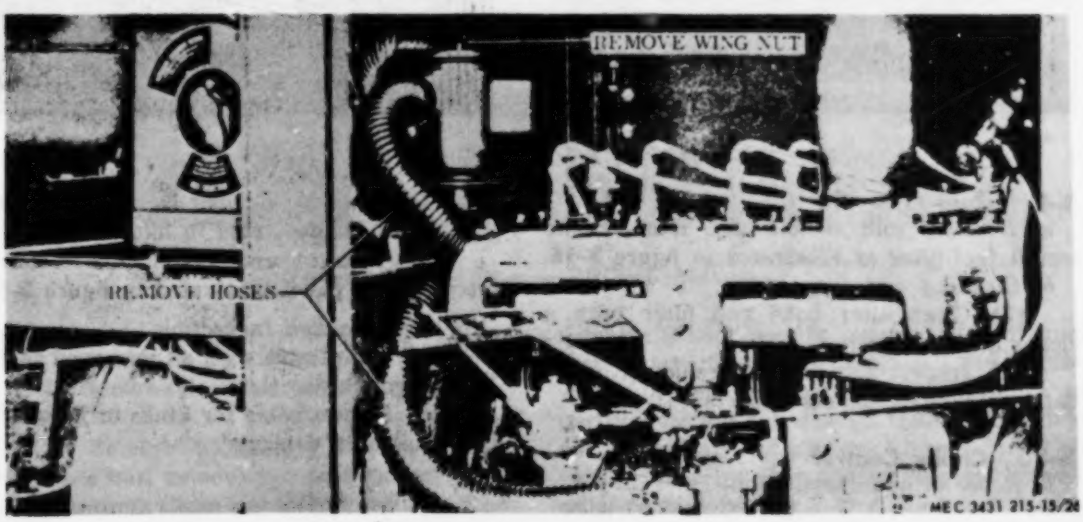

REMOVE WING NUT
REMOVE HOSES
MEC 3431 215-15/24

Figure 3-13. Air cleaner, removal and installation.

in figure 3-13. Refill air cleaner oil reservoir in accordance with figure 3-1.

3-28. Engine Speed Governor

a. Removal and Installation. Remove and install governor as illustrated in figure 3-14.

b. Cleaning and Inspection. Clean the governor with an approved solvent. Dry thoroughly. Inspect for cracks or breaks. Replace if necessary.

c. Adjustment.

(1) Loosen locknut on engine side of

sensitivity screw and turn head of pin clockwise to maximum position. Tighten locknut.

(2) Adjust length of governor rod by screwing ball joint housing along rod until the rod just fits between arm on governor shaft in straight position and throttle shaft clamp is in maximum clockwise position.

(3) Push idler regulator rod (fig. 3–10) toward carburetor on pin in full throttle position.

(4) Operate welding machine under load and set speed adjusting screw to obtain 1400 rpm, (1800 rpm for Model LEB 300).

(5) Securely lock adjusting screw.

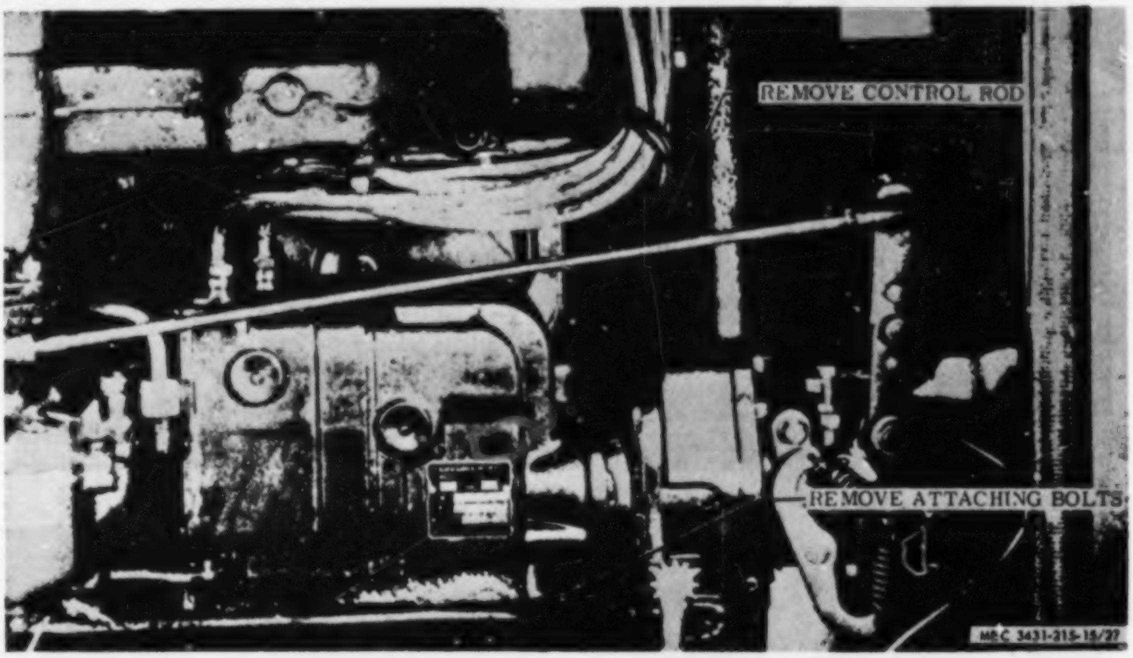


Figure 3–14. Engine speed governor, removal and installation.

3–29. Fuel Filter

a. Removal and Installation. Remove and install fuel filter as illustrated in figure 3–15.

b. Cleaning and Inspection.

(1) Clean filter bowl and filter with a clean, lint-free cloth.

(2) Inspect for cracks, breaks or other damage. Replace damaged parts.

3–30. Choke Control

a. Removal and Installation.

(1) Remove and install choke cable from carburetor as illustrated in figure 3–10.

(2) Remove and install choke control from control panel illustrated in figure 2–2.

b. Cleaning and Inspection.

(1) Clean cable with an approved solvent. Dry thoroughly.

(2) Inspect cable for kinks or breaks. Replace cable if damaged.

Section X. ENGINE ELECTRICAL SYSTEM

3–31. General

Two basic electrical circuits comprise the electrical system. They are the ignition circuit and the starting circuit. The ignition circuit consists of a magneto mounted on the right front of the engine, spark plugs and spark plug cables. The starting circuit consists of a 24 volt starter which is connected to two 12 volt batteries, a generator, regulator and ammeter. The starter switch is mounted on the control panel and is electrically connected to the solenoid mounted on the starter.

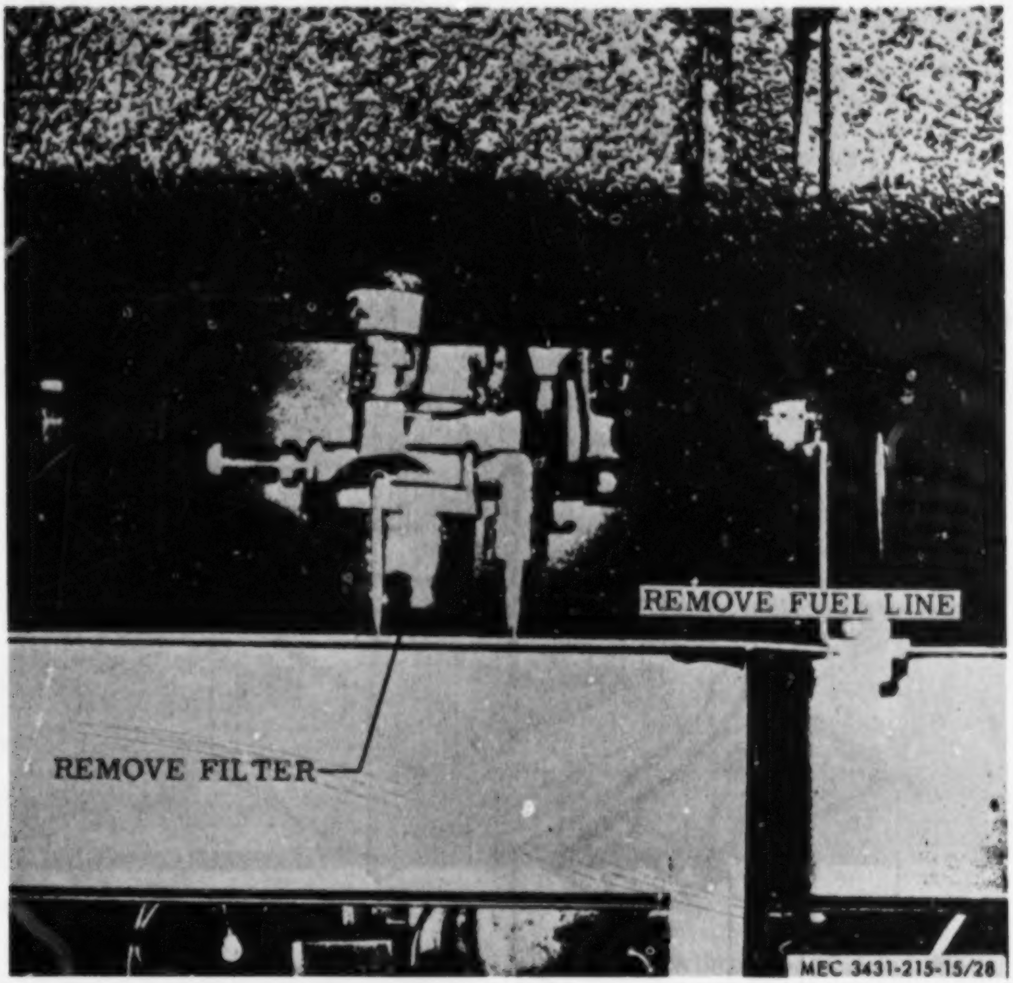


Figure 3-15. Fuel filter removal and installation.

3-32. Batteries

a. Removal.

(1) Remove electrical leads to the battery terminals.

(2) Remove wing nuts holding battery hold down bar, remove bar and battery.

b. Cleaning. Clean corrosive deposits from batteries, hold-down bar and attaching parts with baking soda and water solution and wire or stiff bristle brush. Flush all parts with clean water and dry with compressed air.

c. Installation. Reinstall the batteries by reversing the removal procedure.

d. Servicing. Use only fully charged batteries when reinstalling batteries in welding machine. Check specific gravity with hydrometer. If specific gravity is below 1,250, replace with fully charged battery. Test battery capacity with high-discharge tester. If individual cell volgage falls below 1.5 volts or if cell voltage vary by more than 0.20 volts between cells, replace battery.

e. Removal and Installation (Models LEB 300 and LEW 300).

(1) Refer to figure 3-16 to remove and install the battery.

3-33. Magneto

a. Removal and Installation. Remove and install magneto as illustrated in figure 3-17.

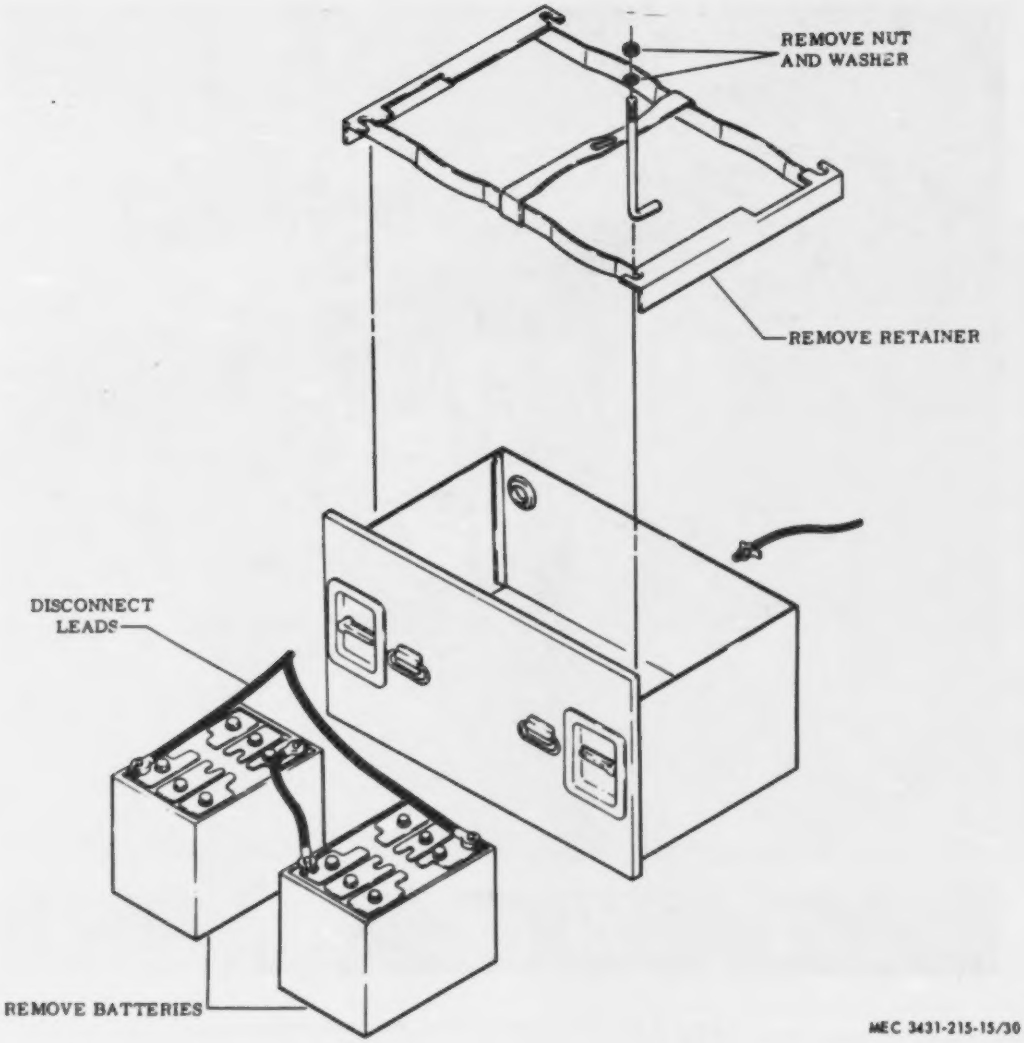


Figure 3-16. Battery, removal and installation (Model LEB 300 and LEW 300).

b. Cleaning and Inspection.

(1) Wipe outside of magneto with a solvent-dampened cloth and dry thoroughly.

(2) Inspect magneto for cracks, breaks or other damage. Replace if damaged.

c. Adjustment.

(1) Remove No. 1 spark plug. Crank engine until air is exhausting from spark plug hole (engine on compression stroke).

(2) Set No. 1 piston near top dead center by slowly cranking engine until air is no longer exhausting from spark plug hole. Replace No. 1 spark plug.

(3) Remove magneto and place in a cloth-lined vise.

(4) Place free end of No. 1 spark plug lead within 1/16 inch of magneto housing. Rotate lugs of impulse coupling clockwise until a spark occurs between lead and housing.

(5) Turn impulse coupling drive lugs back approximately ¼ turn to align lugs with slot in governor drive shaft. Replace magneto.

d. Timing After Installation.

(1) Connect a timing light to No. 1 spark plug and a 24-volt power source.

(2) Start engine and idle at 950 rpm (1000 rpm for LEB 300).

(3) Point timing light through timing hole in flywheel housing. If timing is correct, flywheel timing mark will align with flywheel housing reference hole each time the light light flashes.

(4) To correct faulty timing, loosen magneto mounting screws and turn magneto clockwise or counterclockwise until timing is correct. Tighten magneto screws.

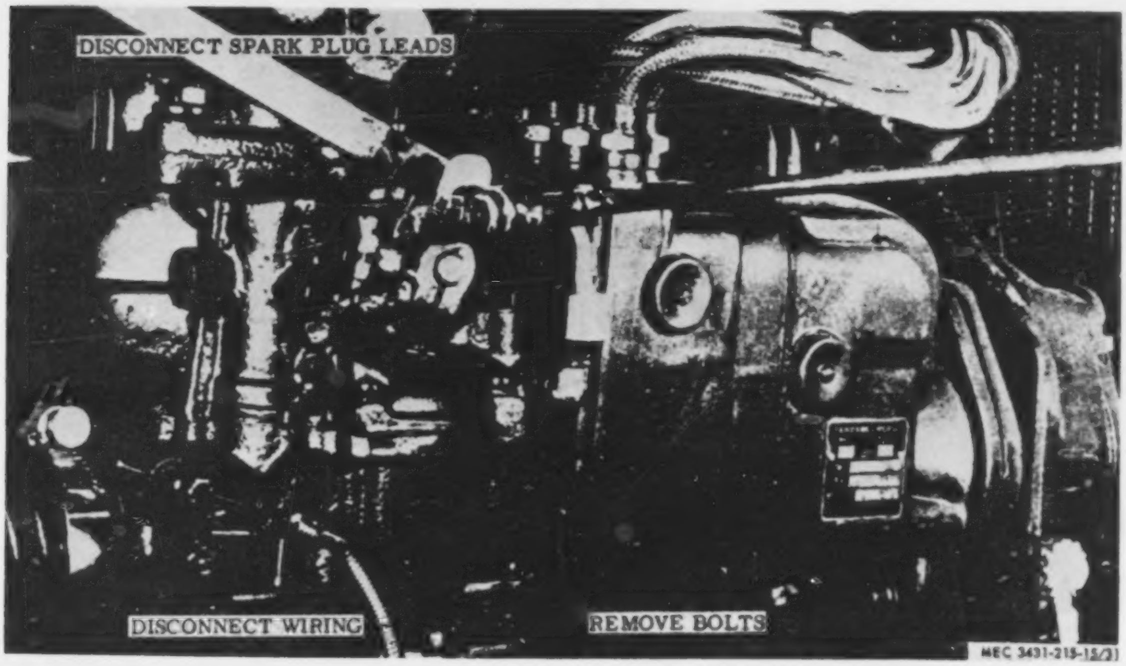


Figure 3–17. Magneto removal and installation.

3–34. Starter Motor

a. Removal and Installation. Remove and install starter and solenoid as illustrated in figure 3–18.

b. To remove solenoid from starter, disconnect solenoid leads and remove attaching screws and lockwashers. Remove cover by removing attaching hardware, then remove insulator, spring, contact and contact push rod from housing.

c. Cleaning and Inspection.

(1) Clean outside housing with a solvent-dampened cloth, dry thoroughly with compressed air.

(2) Blow out inside of starter with low pressure air.

(3) Inspect brushes for excessive wear. Replace brushes if worn more than ½ of original length. (Original length is .625 inch = 10%).

(4) Check brush springs for tension of 24 ounces.

(5) Inspect inside of cover band for evidence of thrown solder.

d. Testing. Subject starter to no-load and lock-torque test using equipment shown in figure 3–19. For no-load test, connect starter in series with a battery, an ammeter capable of reading 500 amperes and a low-resistance, high-wattage variable resistor. With the brake arm disconnected and with 23.5 volts applied to the input terminal, the starter should rotate at 2,500 rpm and draw a maximum of 35 amperes. For lock test, connect brake arm to starter pinion and apply 19.1 volts to input terminal. Starter should draw 265 amperes and scale indicate 19 ft-lb of torque. The starter solenoid should be tested for current draw of both windings in parallel and draw of hold-in winding alone. Disconnect both leads from main terminal. Ground terminal, normally connected from starter, to solenoid case with jumper lead. Connect batteries, variable resistor and ammeter between solenoid case and smaller terminal. Connect voltmeter between solenoid case and small terminal. Slowly increase voltage to 12.0 and 30.0 amperes. Disconnect jumper lead grounding main solenoid terminal and readjust resistor to obtain 12.0 volts on voltmeter. Ammeter should indicate 4.75 to 5.75 amperes for current draw of hold-in winding.

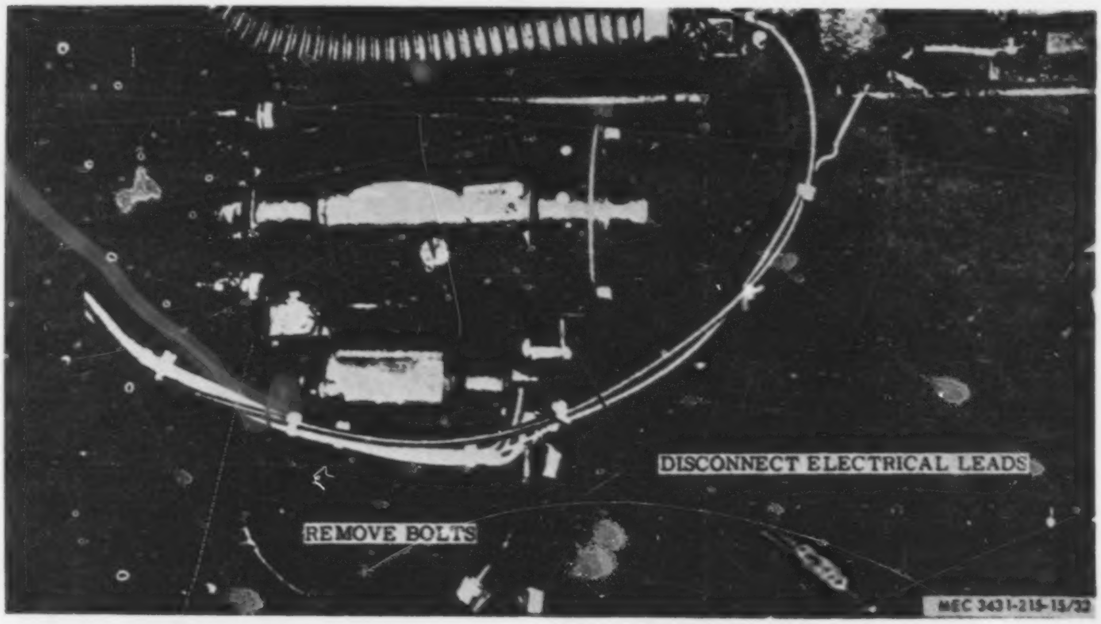

DISCONNECT ELECTRICAL LEADS
REMOVE BOLTS
MEC 3431-215-15/32

Figure 3–18. Starter removal and installation.

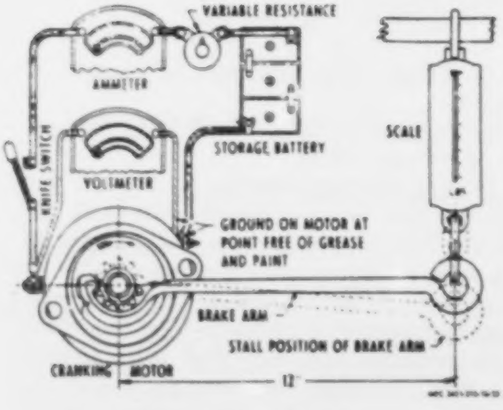

VARIABLE RESISTANCE
AMMETER
STORAGE BATTERY
SCALE
KNIFE SWITCH
VOLTMETER
GROUND ON MOTOR AT POINT FREE OF GREASE AND PAINT
BRAKE ARM
STALL POSITION OF BRAKE ARM
CRANKING MOTOR
12"

Figure 3–19. Starter testing connections.

3–35. Spark Plugs and Lead Assembly

a. Removal and Installation. Remove and install spark plugs and ignition leads as illustrated in figure 3–20.

b. Cleaning and Inspection.

(1) Wipe plugs and ignition leads with a solvent dampened cloth. Dry thoroughly.

(2) Inspect leads for loose or frayed shielding and insulation.

(3) Inspect grommets for hardness or lack of resiliency.

(4) Inspect plugs for burnt electordes and cracked or carbonized porcelain insulators.

(5) Abrasive blast plugs in cleaning and testing machine for three to six seconds while moving plug in a circular direction.

(6) Air blast plug for two to five seconds, then file electrode sparking area to obtain flat parallel surfaces.

(7) Reset gap to 0.025 inch by bending side electrode.

3–36. Generator Assembly, Brushes and Mounting Bracket

a. Removal and Installation.

(1) Remove and install generator assem-

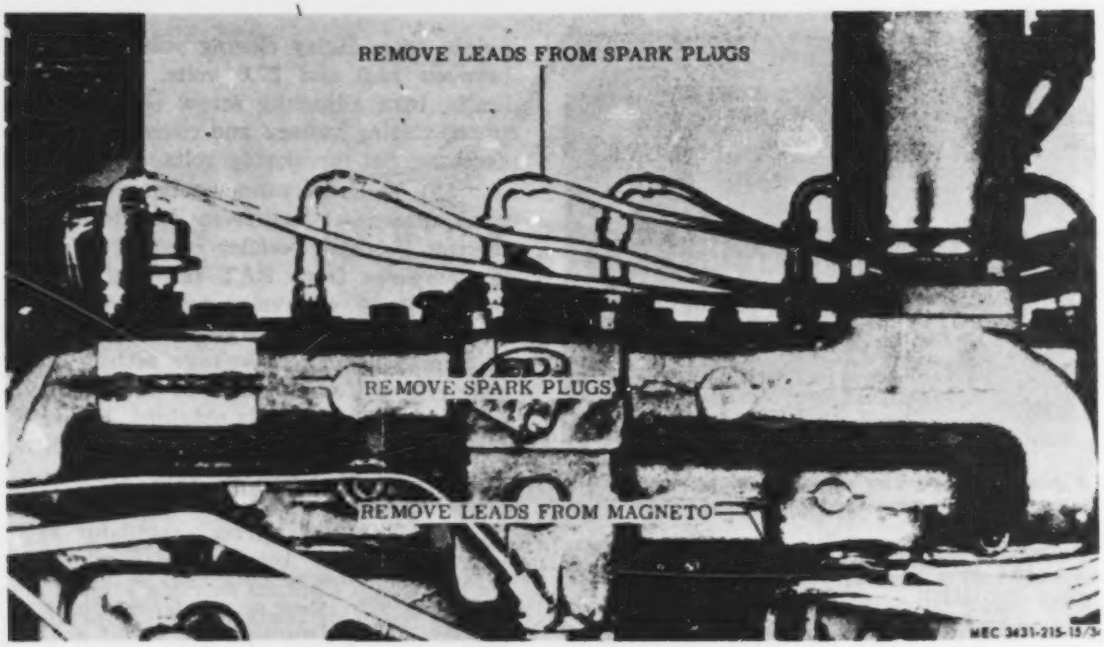


Figure 3-20. Spark plugs and lead removal and installation.

bly and mounting bracket as illustrated in figure 3–1.

(2) Remove cover band, then remove brushes by removing attaching screw. Reverse this procedure for installing brushes and cover band.

b. Cleaning and Inspection.

(1) Clean outside of housing with a solvent-dampened cloth; dry thoroughly with compressed air.

(2) Blow out inside of generator with low pressure air.

(3) Inspect brushes for excessive wear. Replace brushes if worn to more than ½ inch.

(4) Check brush spring tension for 28 ounces.

(5) Inspect inside of cover band for evidence of thrown solder.

c. Testing.

(1) Connect generator to voltage regulator and battery.

(2) Polarize generator by momentarily jumper lead between GEN (Generator) and BAT (Battery) terminals of voltage regulator.

(3) Connect 0–5 ampere ammeter in series with lead to FLD (Field) terminal and 0–50 ampere ammeter in series with lead to ARM (Armature) terminal.

(4) Connect 0–50 volt voltmeter from FLD terminal to generator frame and 0–50 volt voltmeter from ARM terminal to frame.

(5) Connect low-resistance, high-wattage variable resistance from ARM terminal to frame through a heavy-duty knife switch.

(6) Disconnect generator from voltage regulator and rotate generator at a speed to obtain 24 volts at the FLD terminal. Ammeter should indicate between 0.94 and 1.02 amperes.

(7) Rotate generator at 1900 RPM and close knife switch. Adjust resistor to obtain 18.0 amperes at ARM lead. Voltmeter should indicate 25.8 to 26.2 volts.

3–37. Voltage Regulator

a. Removal and Installation. Remove and install voltage regulator as illustrated in figure 3–22.

b. Cleaning and Inspection.

(1) Wipe outside cover with solvent-dampened cloth; dry thoroughly.

(2) Wipe dirt from inside of regulator with clean, lint-free cloth. Boow out assembly with compressed air.

(3) Inspect contact points for pitted or burnt spots.

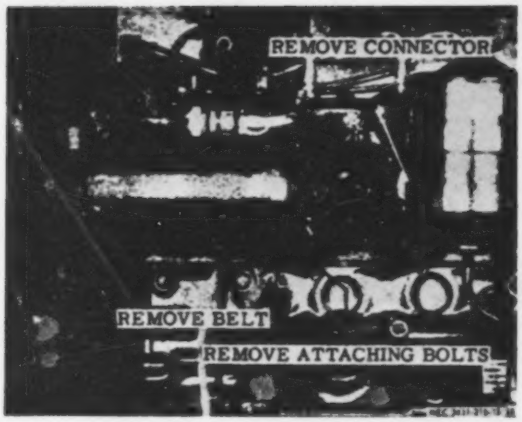


Figure 3-21. Generator assembly and mounting bracket, removal and installation.

(4) Inspect all parts for burnt or blackened insulation.

c. Adjustment and Test.

(1) Clean contacts with spoon or riffler file (fig. 3-23).

(2) To adjust cutout relay air gap, loosen two screws and place fingers on armature. Move armature down until points just close, then measure air gap between armature and center of core. Raise or lower armature as required to obtain air gap of 0.017 inch, then tighten screws. Make sure both contact points close simultaneously. If not, bend one spring finger.

(3) Adjust voltage regulator air gap and current regulator air gap in the same manner as described for the cutout relay. Adjust these air gaps to 0.075 inches.

(4) To adjust cutout relay point opening, bend upper armature stop which is hooked over edge of inside spring finger to obtain 0.032 inch.

(5) Connect voltage regulator into circuit with battery charging regulator and battery.

(6) To check closing voltage of cutout relay, connect 0-50 volt dc voltmeter between GEN terminal and frame. Slowly increase generator speed and note relay closing voltage. Decrease generator speed and make sure contact points open. Relay closing voltage should be between 24.0 and 27.0 volts. If not within limits, turn adjusting screw clockwise to increase closing voltage and counterclockwise to decrease. Set for closing voltage of 25.5 volts.

(7) To check voltage setting of regulator relay, disconnect lead from BAT terminal and connect 1½ ohm resistor capable of carrying ten amperes from BAT terminal to frame. Connect 0-50 volt voltmeter in parallel with resistor. Operate generator at 1900 rpm for 15 minutes and note voltage setting on voltmeter. If not within 27.5 to 29.5 volts, turn screw until 28.5 volts is obtained. Reduce generator speed until relay points open, then return generator speed to 1900 rpm and recheck voltage setting.

(8) To check current regulator setting, connect ammeter between battery lead and BAT terminal. Connect shorting jumper across voltage regulator contact points. Operate generator at 1900 rpm and note current setting. Setting should be between 16 and 20 amperes.

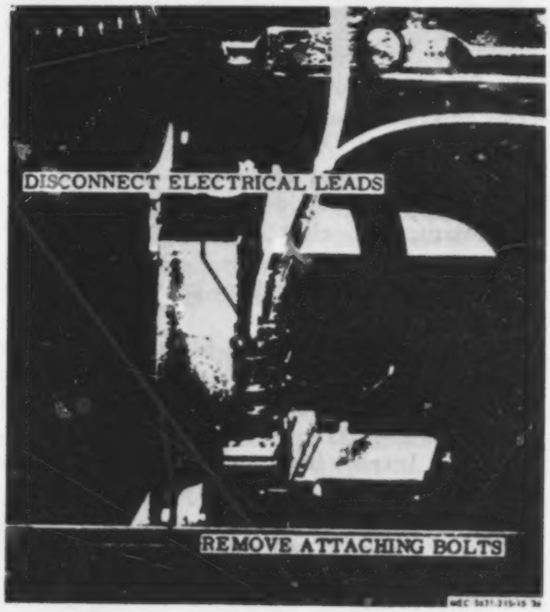


Figure 3-22. Voltage regulator, removal and installation.

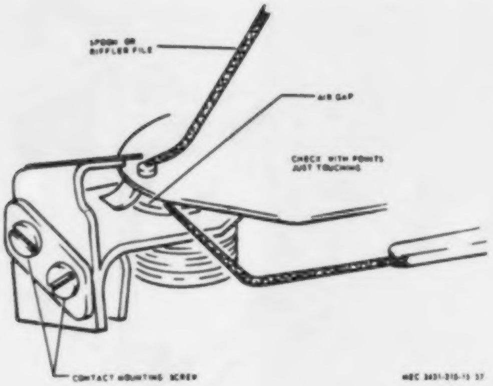


Figure 3–23. Voltage regulator adjustment.

Section XI. COOLING SYSTEM

3–38. General

The coolant is circulated by a belt-driven, self-lubricated bearing type water pump. A push-type fan forces air through the radiator. The coolant passes from an outlet at bottom of radiator through the pump directly into engine block and is circulated through water jacket which surrounds cylinders and valve seats. The coolant is returned to radiator through an outlet elbow on top of cylinder head. A thermostat, mounted inside thermostat housing, prevents return of coolant until a temperature of 150° F. is exceeded.

3–39. Radiator

a. Removal and Installation.

(1) Remove batteries (Models LEB 300 and LEW 300).

(2) Drain radiator.

(3) Remove and install radiator as illustrated in figure 3–24.

b. Cleaning and Inspection.

(1) Clean air passages in radiator core with fine spray of water or compressed air. Apply water on air in opposite direction to normal air flow. Reverse flush radiator as illustrated in figure 3–25.

(2) Inspect all parts for cracks, breaks or other damage.

(3) Replace all damage or defective parts.

3–40. Thermostat and Housing

a. Removal and Installation. Remove and install thermostat and thermostat housing as illustrated in figure 3–26.

b. Testing. Test thermostat for proper operation by suspending it and a thermometer in a container of water. Heat the water. When thermometer indicates 150° F., thermostat should be completely open. Remove thermostat from water. The cooler surrounding air should cause a pronounced closing action and thermostat should be completely closed within a short time. Replace a defective thermostat.

c. Cleaning and Inspection.

(1) Clean all parts with an approved solvent and dry thoroughly.

(2) Clean gasket material from the thermostat housing and the cylinder head.

(3) Inspect for cracks, breaks or other damage. Replace all damaged parts.

3–41. Water Pump and Fan Assembly

a. Removal and Installation.

(1) Remove batteries (Models LEB 300 and LEW 300).

(2) Drain radiator.

(3) Remove radiator.

(4) Remove and install water pump and fan assembly as illustrated in figure 3–27.

b. Cleaning and Inspection.

(1) Clean all parts, other than fan belt, with an approved solvent. Remove pump gasket material from pump.

(2) Inspect all parts for breaks, cracks or other damage. Replace damaged parts.

c. Fan Belt Adjustment.

(1) Loosen battery charging generator and pull generator away from engine. Tighten generator bolt.

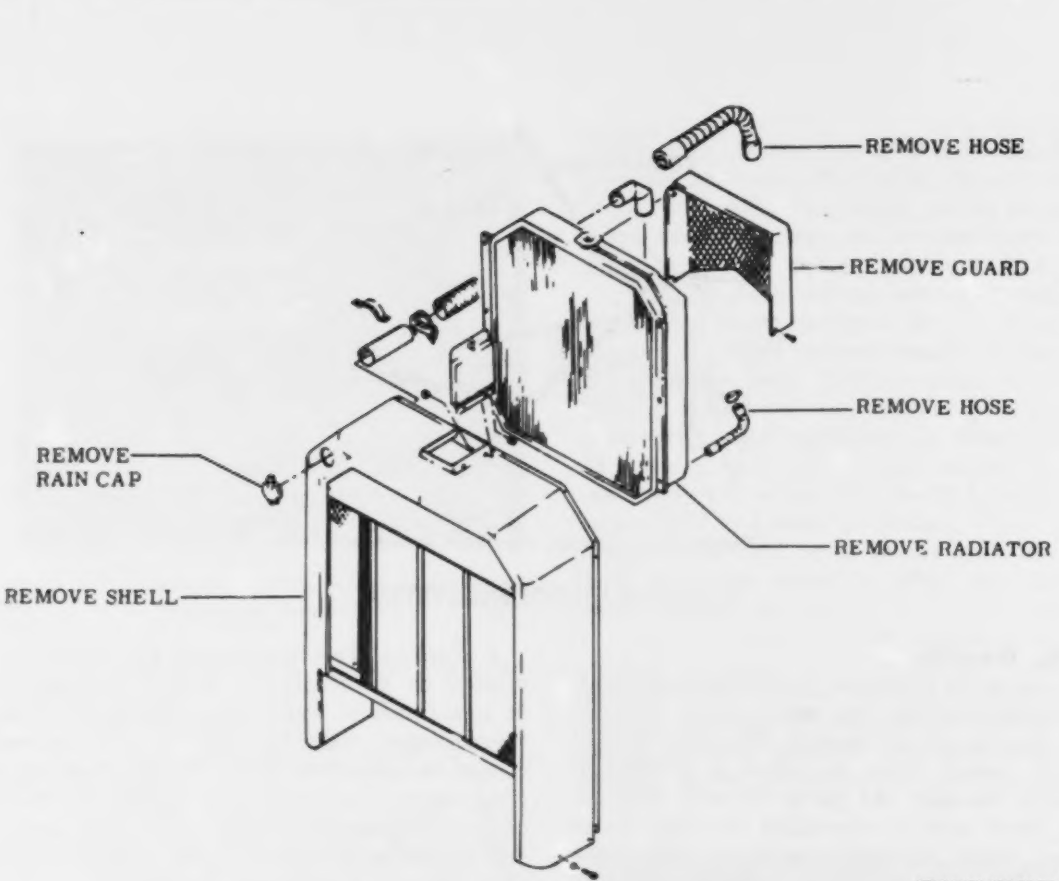

REMOVE HOSE
REMOVE GUARD
REMOVE HOSE
REMOVE RAIN CAP
REMOVE RADIATOR
REMOVE SHELL
MEC 3431-215-15/38

Figure 3-24. Radiator, removal and installation.

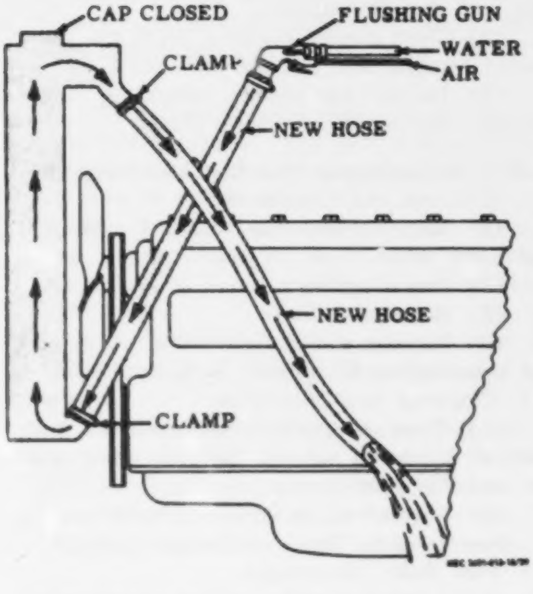

CAP CLOSED
FLUSHING GUN
CLAMP
WATER
AIR
NEW HOSE
NEW HOSE
CLAMP

Figure 3-25. Reverse flushing cooling system.

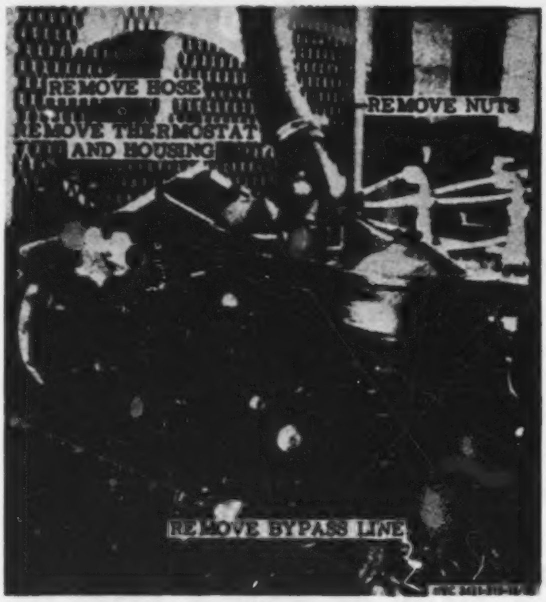

REMOVE HOSE
REMOVE NUTS
REMOVE THERMOSTAT AND HOUSING
REMOVE BYPASS LINE

Figure 3-26. Thermostat and housing, removal and installation.

(2) Fan belt should have 5/8 inch deflection at a point half way between generator pulley and fan pulley.

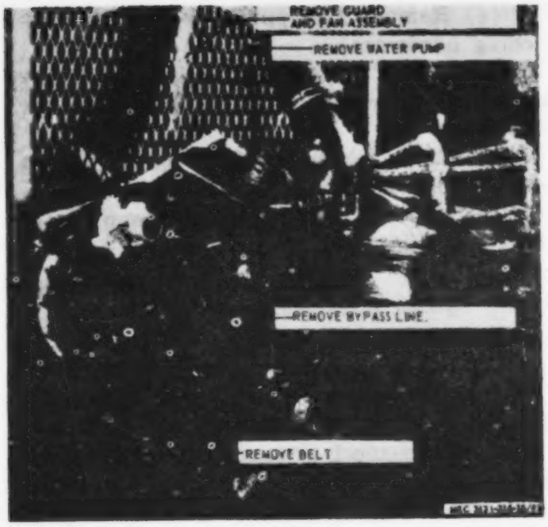


Figure 3–27. Water pump and fan assembly, removal and installation.

Section XII. COOLANT HEATER (Model LEW 300)

3–42. General

The coolant heating system consists of the water heater, pump, valves, lines and switches necessary to provide heat for cold weather operation of the welding machine.

3–43. Heater

a. Removal. (*Refer to figure 3–28*).

(1) Shut off water valve (1, fig. 3–28).

(2) Disconnect hoses at heater.

(3) Disconnect fuel hose (2).

(4) Disconnect electrical wiring to heater and tag each wire.

(5) Remove hose (3) by removing clamps (4 and 5).

(6) Remove heater assembly by removing wing nuts and tiedown.

b. Inspection.

(1) Inspect hoses for cracks or other signs of deterioration.

(2) Inspect water valves and outlets for cracks or other defects which may result in leakage.

c. Cleaning. Clean all parts with a solvent-dampened cloth.

d. Repair. The only repair required on the heater assembly is the replacement of defective parts.

e. Installation. Install heater assembly by reversing removal procedures.

3–44. Fuel Solenoid Valve

a. Removal. (fig. 3–28).

(1) Disconnect fuel solenoid valve leads from the overheat switch.

(2) Loosen compression nut (7) at the lower end of standpipe (8) until the standpipe will turn freely in the fitting.

(3) Hold the fuel solenoid valve (6) firmly and unscrew the standpipe from the valve.

b. Inspection. Inspect the fuel solenoid valve for any visual indications of damage.

c. Cleaning. Clean the valve with a solvent-dampened cloth.

d. Installation. Install the fuel solenoid valve by reversing the removal procedures.

3–45. Fuel Pump Assembly

a. Removal. (fig. 3–28).

(1) Disconnect fuel line from fuel tank to fuel pump (9).

(2) Disconnect fuel hose (2) from fuel pump to heater.

(3) Disconnect electrical leads to fuel pump.

(4) Remove fuel pump by removing attaching hardware.

b. Inspection. Inspect the fuel pump for any indication of visual damage. Inspect filter for cleanliness.

c. Cleaning. Clean the fuel pump with a solvent-dampened cloth.

d. Installation. Install the fuel pump by reversing the removal procedures.

3–46. Igniter Assembly

a. Removal. (fig. 3–28).

(1) Remove cover (10) by loosening nuts (11), and turning cover in a counterclockwise direction.

(2) Disconnect ground lead (12) by removing nut (13) and lockwasher (14) from inside the heater housing (27) and bend igniter ground wire so that it will fit inside a deep socket.

(3) Disconnect the connecting strap of the preheat resistor (16) and remove igniter (15).

b. Inspection. Inspect the igniter for excess deposit of carbon.

c. Cleaning. Clean the carbon from the igniter with a sharp tool.

d. Repair. Replace the igniter if it cannot be repaired.

e. Installation. Install the igniter by reversing the removal procedures.

3–47. Preheater Resistor

a. Removal. (fig. 3–28).

(1) Remove cover (10) by loosening nuts (11) and turning cover in a counterclockwise direction.

(2) Remove the screws (17) from the flange (18) which surrounds the standpipe (8). Leave one plate loose on the standpipe and remove slotted plate (19) from inside the heater housing.

(3) Disconnect the ground strap and the electrical lead of the preheat resistor (16) from terminal number 7 of the terminal board (20).

(4) Remove the compression nut (7) at the lower end of the standpipe (8) and lift out standpipe, preheater resistor (16) and flange (18) through opening in the heater housing (27).

b. Installation. Install the preheater resistor by reversing the removal procedure.

3–48. Flame Detector Switch

a. Removal. (fig. 3–28).

(1) Remove blower assembly (21) by loosening nuts (22) and turning blower in a clockwise direction.

(2) Disconnect electrical leads from blower (21) to terminal block (20).

(3) Disconnect electrical leads from flame detector switch (23) to terminal block (20).

(4) Loosen compression nut which attaches switch (23) to heater burner (24). Pull the switch wires through the grommet (25) in the heaterhousing, then pull the switch straight out of the heater burner, being careful not to bend the steel tube.

***Caution:* This tube contains a quartz rod which may be broken by excessive bending of the tube.**

b. Adjustment.

(1) Loosen switch mounting nuts.

(2) Back off the adjusting screw until the switch clicks.

(3) Slowly turn the adjusting screw in until the microswitch clicks.

(4) Turn the adjusting screw in ¾ turn past the click point.

1	Valve
2	Hose
3	Air hose
4	Clamp
5	Clamp
6	Fuel solenoid valve
7	Compression nut
8	Standpipe
9	Fuel pump
10	Cover
11	Nut
12	Ground lead
13	Nut
14	Lockwasher
15	Igniter
16	Preheat resistor
17	Screw
18	Flange
19	Plate
20	Terminal board
21	Blower assembly
22	Nut
23	Flame detector switch
24	Heater burner assembly
25	Grommet
26	Screw
27	Heater housing

Figure 3–28.—Continued

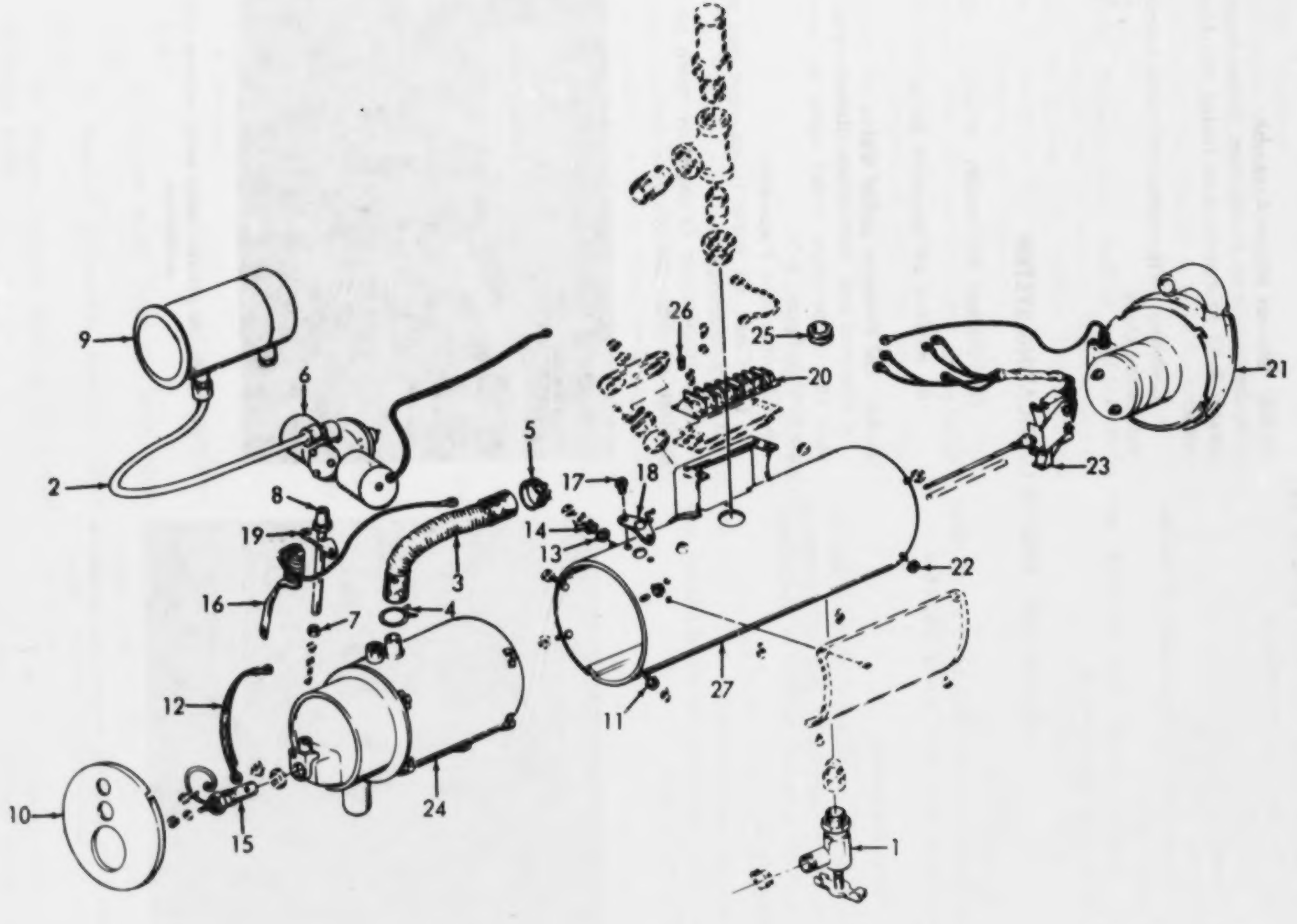

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Figure 3-28. Coolant heater removal and installation.

(5) Hold the adjusting screws and tighten the mounting nuts.

c. Installation. Install the flame detector by reversing the removal procedures.

3–49. Terminal Board

a. Removal. (fig. 3–28).

(1) Disconnect electrical wires to the terminal board (20).

(2) Remove screws (26) securing terminal board to heater housing.

b. Installation. Install the terminal board by reversing the removal procedures.

3–50. Blower Motor Assembly

a. Removal and Installation. Refer to paragraph 3–48 to remove and install the blower motor.

b. Cleaning. Wipe motor off with a solvent dampened cloth.

Section XIII. ENGINE LUBRICATING SYSTEM

3–51. General

The lubrication system consists of an oil filter and associated lines and safety switches.

3–52. Filter Assembly

a. Removal and Installation. Remove and install the filter assembly, low oil pressure switch, and oil pressure switch in accordance with figure 3–29.

b. Cleaning and Inspection.

(1) Clean all parts in an approved solvent. Dry thoroughly.

(2) Inspect for cracks, breaks or damaged parts.

(3) Replace all damaged parts.

3–53. Oil Pressure Relief Valve

a. Removal and Installation. Remove and install the oil pressure relief valve in accordance with figure 3–30.

b. Cleaning and Inspection.

(1) Clean all parts in an approved solvent. Dry thoroughly.

(2) Inspect for damaged or worn parts. Replace all damaged or worn parts.

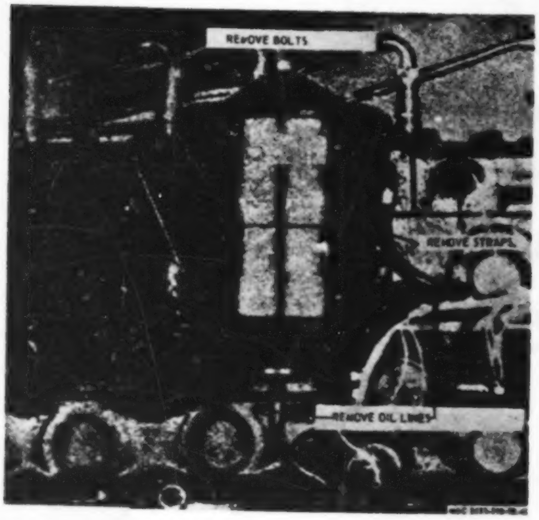


Figure 3–29. Filter assembly, removal and installation.

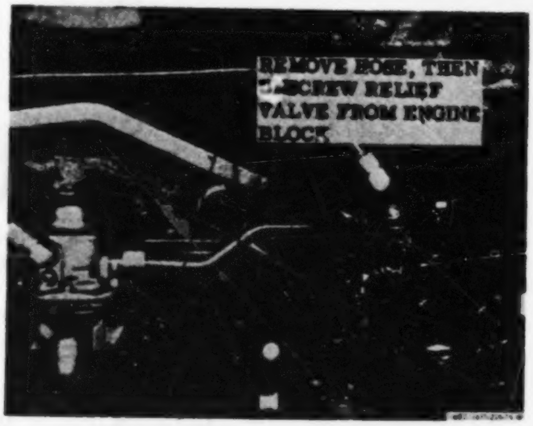


Figure 3–30. Oil pressure relief valve, removal and installation.

Section XIV. EXHAUST SYSTEM

3–54. General

The engine exhaust system includes the exhaust tube, muffler and exhaust manifold. The exhaust gases are discharged from the engine through the exhaust manifold and muffler to the outside of the unit enclosure.

3–55. Exhaust Tube, Muffler, and Manifold

a. Removal and Installation. Remove and install the exhaust tube, muffler, and manifold as illustrated in figure 3–31.

b. Cleaning and Inspection.

(1) Clean all corrosion and scale from exhaust tube. Remove corrosion from muffler and manifold with a wire brush.

(2) Inspect all parts for holes, cracks, bends, dents, distortion, or other damage. Replace all damaged parts.

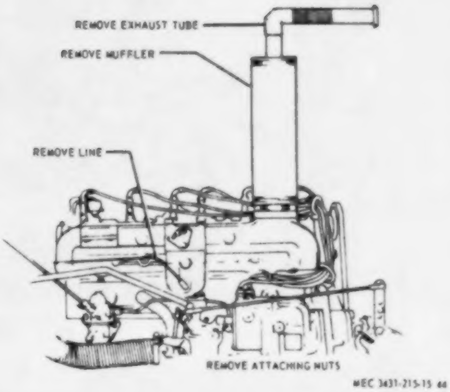


Figure 3–31. Exhaust system, removal and installation.

Section XV. CONTROLS AND INSTRUMENTS

3–56. General

a. The controls and instruments located on the panel consists of temperature indicator, various switches, fuel and water indicators, oil pressure indicator, time totalizing meter, meters, and wiring harness.

b. Refer to paragraph 3–21 to remove and install control panel.

c. Removal and Installation. Remove and install controls and instruments as follows:

(1) Disconnect terminal leads or cables from rear of control panel.

(2) Remove mounting hardware.

(3) Remove control or instrument.

d. Cleaning and Inspection.

(1) Clean all parts with a solvent-dampened cloth. Dry thoroughly.

(2) Inspect instruments and switches for corroded terminals, broken glass, wear, or other defects. Replace all damaged parts.

Section XVI. ENGINE

3–57. General

The only parts of the engine assembly which may be replaced by organizational maintenance are the cylinder head, valve tappet cover assembly, and adjustment of valve lifters.

3–58. Cylinder Head

a. Removal.

(1) Remove oil filter and bracket (para 3–52).

(2) Remove spark plugs and leads (para 3–35).

(3) Remove thermostat housing (para 3–40).

(4) Remove cylinder head as illustrated in figure 3–32.

b. Cleaning and Inspection.

(1) Clean cylinder head with approved solvent. Dry thoroughly.

(2) Inspect cylinder head for cracks or other damage. Replace cylinder head if damaged; install new gasket.

c. Installation.

(1) Install cylinder head as illustrated in figure 3–32.

(2) Tighten cylinder head bolts in sequence shown in figure 3–33.

(3) Install thermostat housing, spark plugs, and oil filter and bracket.

3–59. Valve Tappet Cover

a. Removal.

(1) Remove carburetor (para 3–24).

(2) Remove manifold (para 3–55).

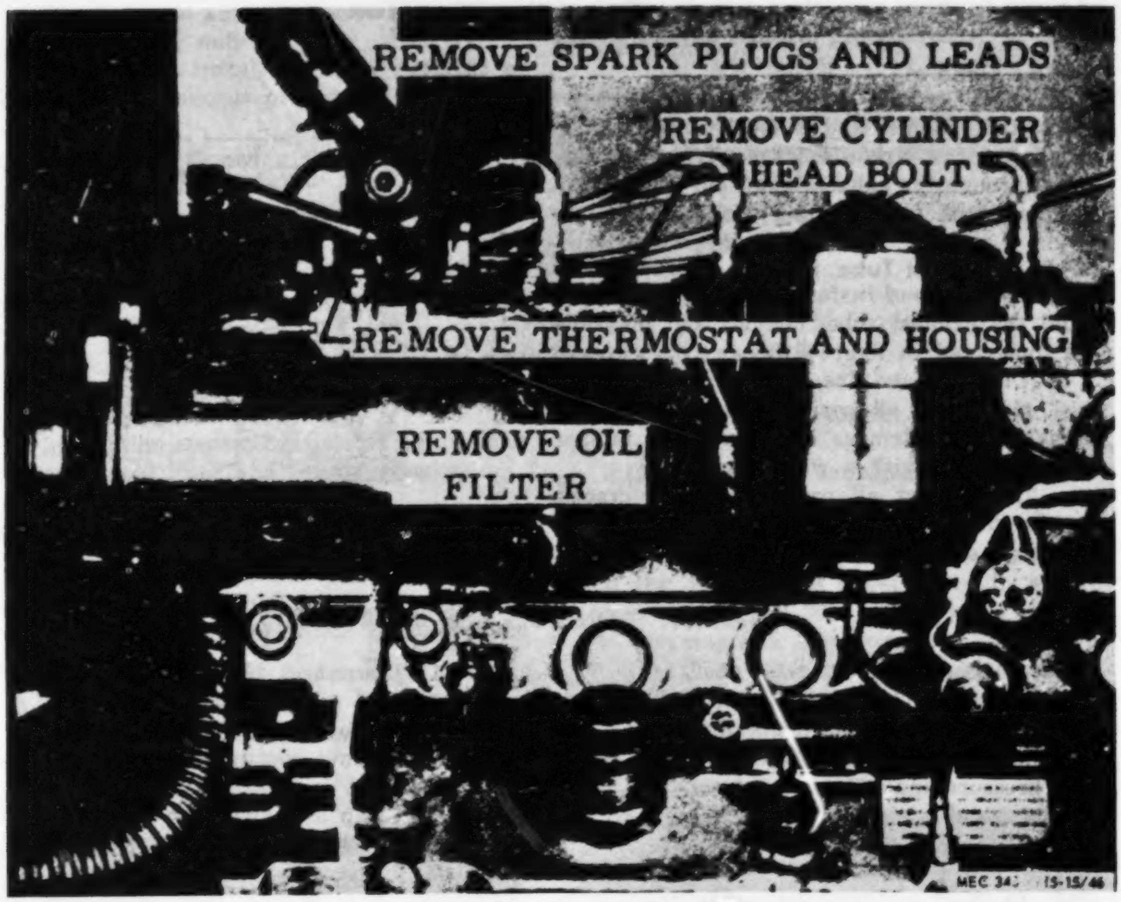
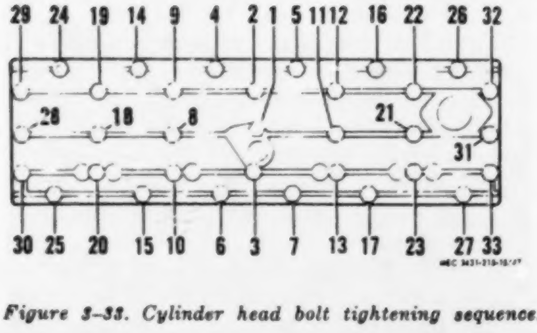

REMOVE SPARK PLUGS AND LEADS
REMOVE CYLINDER HEAD BOLT
REMOVE THERMOSTAT AND HOUSING
REMOVE OIL FILTER

Figure 3–32. Cylinder head, removal and installation.


29
24
19
14
9
4
2
1
5
11
12
16
22
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32
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25
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15
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3
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23
27
33

Figure 3–33. Cylinder head bolt tightening sequence.

(3) Remove valve tappet cover as illustrated in figure 3–34.

b. Cleaning and Inspection.

(1) Clean cover assembly with an approved solvent. Dry thoroughly.

(2) Remove old gasket from cover and block.

(3) Inspect cover for cracks or other damage. Replace cover if damaged; install new gasket.

c. Installation.

Reverse removal procedure to reinstall the valve tappet cover.

3–60. Adjusting Valve Tappets

a. Remove cover assembly (para 3–59).

b. Using two end wrenches and a feeler gauge, adjust each tappet adjusting screw so that a slight drag is felt when 0.014 inch feeler gauge blade is withdrawn. Adjust when engine is hot.

c. Replace cover (para 3–59).

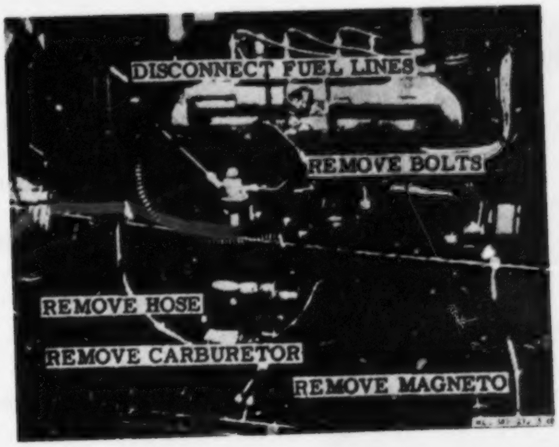


Figure 3-34. Valve tappet cover removal and installation.

Section XVII. ARC WELDER

3-61. General

The arc welder is comprised mainly of the generator assembly, brushholder assembly, and their associated components.

3-62. Welding Generator

a. Inspection.

(1) Inspect welder for any evidence of damage.

(2) Inspect brushes for wear beyond ½ inch.

b. Service. Clean outside of generator with a solvent-dampened cloth.

c. Repair.

(1) Replace brushes (para 3-63).

(2) Replace end covers (para 3-64).

3-63. Brushholder

a. Removal and Installation. Remove and install brushholder as illustrated in figure 3-35.

b. Cleaning and Inspection.

(1) Wipe brushholder with a clean lint-free cloth. Blow off with compressed air.

(2) Inspect brushes for wear less than ½ inch.

(3) Inspect spring tension for 32 ounces.

(4) Replace components which do not pass inspection.

3-64. Generator End Cover

a. Removal and Installation.

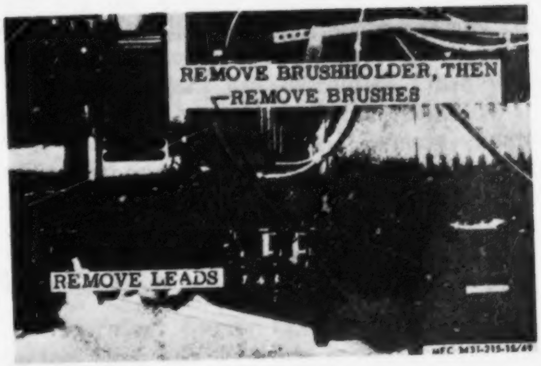


Figure 3-35. Brushholder removal and installation.

(1) Remove panel (para 3-21).

(2) Remove and install end cover as illustrated in figure 3-36.

b. Cleaning and Inspection.

(1) Clean and cover with a solvent dampened cloth. Dry thoroughly.

(2) Inspect cover for cracks, breaks or other damage.

(3) Replace damaged cover.

3-65. Remote Box

a. Removal. Remove remote box from mount by unlatching catch.

b. Cleaning and Inspection.

(1) Clean remote box with a solvent dampened cloth.

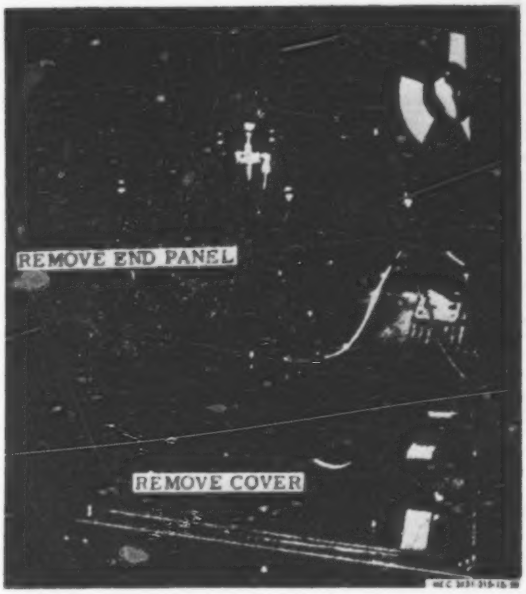

REMOVE END PANEL
REMOVE COVER

Figure 3-36. Generator end cover, removal and installation.

(2) Inspect box for cracks, breaks or other damage.

(3) Repair cracks or breaks using standard sheet metal repair procedures.

c. Installation. Replace remote box on mount and secure the attaching latches.

CHAPTER 4

SHIPMENT, LIMITED STORAGE, AND DEMOLITION

Section I. SHIPMENT AND LIMITED STORAGE

4–1. Preparation of Equipment for Shipment

a. General. Detailed instructions for the preparation of the arc welding machine for domestic shipment are outlined within this paragraph. Preservation will be accomplished in sequence that will not require the operation of previously preserved components.

b. Inspection. The arc welding machine will be inspected for any unusual conditions such as damage, rusting, accumulation of water, and pilferage. Inspection of the individual components and assemblies will be as outlined on the "Preventive Maintenance Check and Services Quarterly", paragraph 3–7 in this manual. All deficiencies and shortcomings will be recorded on DA Form 2404 together with corrective action taken.

c. Cleaning and Drying. Remove all contaminants from Arc Welder using an approved method of cleaning, drying, types of preservatives, and methods of application are described in TM 38–280.

d. Painting. Paint all surfaces where the paint has been removed or damaged. Refer to TM 9–213 for detailed cleaning and painting instructions.

e. Depreservation Guide. DA Form 2258 (Depreservation Guide for Vehicles and Equipment).

(1) Prepare a depreservation guide form for each item of equipment following preservation. Complete all applicable entries on the form to reflect the preservation applied and the depreservation instructions required. Use additional spaces on the reverse side of the form to annotate the preservation applied and depreservation applied and depreservation instructions for components not specifically identified on the form. Place the form in a waterproofed envelope marked "Depreservation Guide" and attach it to the operator's control panel.

(2) Prior to placing equipment in operation or to the extent necessary for inspection, perform depreservation of the item as outlined in the depreservation guide.

f. Cooling System, Boxed or Crated. Completely drain the cooling system including the radiator and block or other accessories through which the coolant has circulated. Flush with clean water. Leave drain cocks open.

g. Combustion Chamber. Remove spark plugs and spray approximately two ounces of P–10, Grade 2 preservative oil conforming to MIL–L–21260, into each cylinder through the spark plug hole while rotating the crankshaft. Coat the spark plug tips with oil and reinstall.

***Warning:* Engine head temperature must be less than 125° F. when preservation is applied to the combustion chamber.**

h. Lubrication System, Boxed or Crated. Check level of lubricant. Operate the engine at fast idle until lubricant has been circulated throughout the system. The crankcase will then be drained and the drain plugs reinstalled.

i. Seal all openings (i.e., engine openings, starter motor, generator electrical) that will permit the direct entry of water, with Class I pressure-sensitive tape conforming to PPP–T–60.

j. Fuel Tank, Boxed or Crated. Drain fuel tank after engine preservation and fog interior with preservation oil, P–10, Grade 2, conforming to Specification MIL–L–21260.

k. Air Cleaner. Drain the air cleaner and seal all openings that permit the direct entry of water. Use Class 1, pressure-sensitive tape conforming to Specification PPP-T-60.

l. Exterior Surfaces. Coat exposed machined ferrous metal surfaces with Type P-6 preservation conforming to Specification MIL-C-11796, Class 3. If preservative is not available, cup grease may be used.

m. Marking. Mark in accordance with MIL-STD-129.

n. Batteries and Cables. Secure batteries in battery compartment. Batteries will be filled and fully charged. Disconnect battery cables and secure to battery support or carrier with PPP-T-60, Class 1 pressure-sensitive tape. Coat battery terminals and cable with type P-6 MIL-C-11796 preservative. Seal battery vent holes with tape specified herein.

o. Disassembly, Disassembled Parts and Basic Issue Items.

(1) Limit the disassembly to the removal of parts and projecting components that tend to increase the overall profile of the unit, and to that which is subjected to pilferage.

(2) Pack the disassembled items, and the publications in the equipment tool box if possible. If the tool box is not of sufficient size to accomodate the removed items, pack in a suitable container and secure to the arc welding machine to prevent loss or pilferage.

Note. If packing is required to provide adequate protection against damage during shipment, refer to TM 38-230 for guidance in crate fabrication.

4-2. Loading Equipment for Shipment

Use appropriate materials handling equipment of sufficient capacity to lift the arc welding machine into the carrier. Block and tie the unit to the carrier to assure that it will not move during transit.

4-3. Preparation of Equipment for Storage

a. General. This paragraph provides instructions for preparation of the arc welding machine for limited storage (not to exceed 6 months). Refer to TB 740-93-3 (Administrative Storage of USAMEC Mechanical Equipment). In addition the following preservation shall be accomplished:

(1) *Air Cleaner.* Clean and refill the air cleaner.

(2) *Combustion Chamber.* Preserve combustion chamber as outlined in paragraph 4-1.

b. Weatherproofing. When suitable shelter is not available, select a firm, level, well-drained storage location, protected from prevailing winds. Position the welding machine on heavy planking or other solid surface. Cover with a tarpaulin or other suitable waterproof covering and tie down securely.

4-4. Inspection and Maintenance of Equipment in Storage

a. Inspection. When the welding machine has been placed in limited storage, all scheduled preventive maintenance services including inspection, shall be suspended and preventive maintenance inspection shall be performed as specified herein. Refer to TB 740-93-3 (Administrative Storage of USAMEC Mechanical Equipment).

Perform quarterly preventive maintenance checks and services when the welding machine is initially placed in limited storage and every 90 days thereafter. Record all deficiencies and shortcomings together with corrective action taken, on DA Form 2404. Required maintenance will be performed promptly to insure that the welding machine is mechanically sound and ready for immediate use.

c. Operation. At the time of quarterly inspection and maintenance, operate the welding machine long enough to bring it up to operating temperature and insure complete lubrication of all bearings, gears, etc.. After each operating period, represerve the welding machine as outlined in paragraph 4-3.

Section II. DEMOLITION OF THE WELDING MACHINE TO PREVENT ENEMY USE

4-5. General

When capture or abandonment of the welding machine to an enemy is imminent, the responsible unit commander must make the decision either to destroy the equipment or to render it inoperative. Based on this decision, orders are issued which cover the desired extent of destruction. Whatever method of demolition is employed, it is essential to destroy the same vital parts of all welding machines and all corresponding repair parts.

4-6. Demolition to Render the Welding Machine Inoperative

a. Demolition by Mechanical Means. Use sledge hammers, crowbars, picks, axes, or other heavy tools which may be available to destroy the following:

(1) Magneto and engine block.

(2) All fuel and oil lines.

(3) Starter and solenoid.

(4) Engine accessory generator.

(5) All controls and instruments.

b. Demolition by Misuse. Perform the following procedures to render the welding machine inoperative.

(1) Drain the radiator and engine block. Pour sand, gravel, nuts, bolts, and screws into the radiator, oil filler pipe, fuel tank, and other openings.

(2) Remove the belts and block the emergency operations switches in the run position. Operate the engine until failure occurs.

4-7. Demolition by Explosives or Weapons Fire

a. Explosives. Place as many of the following charges as the situation permits and detonate them simultaneously with a detonating cord and suitable detonator.

(1) One ½-pound charge between starter and engine block.

(2) One ½-pound charge behind control panel.

(3) One ½-pound charge between battery generator and engine block.

(4) One ½-pound charge below generator assembly.

b. Weapons Fire. Fire on the welding machine with the heaviest practical weapons available.

4-8. Other Demolition Methods

a. Scattering and Concealment. Remove all easily accessible part such as the magneto, fuel and oil lines, starter and solenoid, and engine accessory generator. Scatter them through dense foliage, bury them in dirt or sand, or throw them in a lake, stream, or other body of water.

b. Burning. Pack rags, clothing, or canvas under and around the unit. Saturate the packing with gasoline, oil, or diesel fuel and ignite.

c. Submersion. Totally submerge the welding machine in a body of water to provide water damage and concealment. Salt water will do greater damage to metal parts than fresh water.

4-9. Training

All operators should receive thorough training in the destruction of the welding machine (FM 5-25). Simulated destruction, using all of the methods listed above, should be included in the operator training program. It must be emphasized in training that demolition operations are usually necessitated by critical situations when time available for carrying out destruction is limited. For this reason. It is necessary that operators be thoroughly familiar with all methods of destruction of equipment, and be able to carry out demolition instructions without reference to this or any other manual.

CHAPTER 5

DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE

Section I. GENERAL

5–1. Scope

a. These instructions are published for the use of direct and general support and depot maintenance personnel maintaining the Libby Models LE 300, LEW 300, and LEB 300 Arc Welding Machines. They provide information on the maintenance of the equipment, which is beyond the scope of the tools, equipment, personnel, or supplies normally available to using organizations.

b. Report all equipment improvement recommednations as prescribed by TM 38–750.

5–2. Direct and General Support and Depot Maintenance Record and Report Forms

For record and report forms applicable to direct and general support and depot maintenance refer to TM 38–750.

Section II. DESCRIPTION AND DATA

5–3. Description

For a complete description of the arc welding machine, see paragraph 1–3.

5–4. Tabulated Data

a. General. This paragraph contains all the overhaul data pertinent to direct and general support and depot maintenance personnel.

b. Engine.

Type	Gasoline
Number of cylinders	6
Bore	3 7/16
Stroke	4 3/8
Firing order	1–5–3–6–2–4
Horsepower	48 at 1500 rpm (1800 rpm for LEB 300)

c. Generator Classification and Rating.

Rating	300 amperes at 40 volts (32 volts for LEB 300)
Voltage	20 or 40 volts
Current	60 to 375 amperes
Cooling	Fan
Duty classification	Continuous
Degree of enclosure	Fully enclosed
Drive	Direct

d. Main Generator Rebuild Data.

(1) *Type of winding series.*

Poles	2/4
Volts	100
Amps	300
Turns	23
Size of wire	(0.042 x 7/8) 2 Aluminum 4.35 lbs
Winding	Wind 19 turns 2 wide and 4 turns 2 high

(2) *Type of winding armature.*

Poles	4
Slots	37
Lamination	5 1/2
Diameter	9 3/4 inches
Bars	73
Coils	372
Turns	1–1
Wire	.110 x .240
Wedge form	1/2 pins x 31 3/4 cut, 1/4 off center
Span	1–10
Groups	37
Coils	2

(3) *Types of winding Shunt.*

Poles	2/4
Volts	120
Turns	950 and 250
Wire	19 and 18 S.N.F. (Single, Nylon Formvar)
Pounds	6.5 and 2.8

e. Exciter Generator.

(1) *Type of winding Armature.*

Volts	120
Phase	D.C.
Poles	2
R.P.M. (LE–LEW 1500)	1800
Slots	24
No	155
Laminations	3 3/4
Diameter	4
Bars	48
Coils	24
Turns	4/4–4/4
Wire	(No. 17) 2 HNF (Heavy Nylon Formvar)
Span	1–11
Groups	24
Coils	2
Pounds	5.5

(2) *Types of winding Shunt and Series.*

Poles	2
Volts	125
Amps	1550
Turns	200 and 37
Wire	(No. 22) S.N.F. and (No. 12) S.N.F.
Pounds	8.0 and 3.95

f. Repair and Replacement Standards. Table 5–1 lists the overhaul tolerances and wear limits.

g. Nut and Bolt Torque Data. Refer to paragraph 1–4 for nut and bolt torque data.

h. Wiring Diagram. Refer to figure 1–4 for wiring diagram.

Table 5–1①. Engine Repair Data, Model LE 300

Component	Manufacturer's dimensions and tolerances in in.		Desired clearance		Maximum allowable wear and clearance
	Min	Max	Min	Max	
Cylinders:					
Diameter	3.4375	3.4395	0.005	0.065	0.008
Out-of-round		0.002			0.007
Taper		0.002			0.007
Main Bearings					
Bearing Type Insert:					
Case hole	2.5615	2.5622			
Bearing thickness	0.09250	0.09275			0.0920
Crankshaft size	2.3744	2.3752			2.3734
Clearance			0.0008	0.0028	
Crankshaft:					
End thrust			0.005	0.009	
Pulley fit diameter	1.434	1.4345			
Gear fit diameter	1.435	1.4355			
Main bearing journal fit diameter	2.2445	2.2445			
Crankpin	2.0619	2.0627	0.0007	0.0025	2.0609
Camshaft:					
Clearance limits	0.005	0.015	0.002	0.004	
End play	0.005	0.009			
Journal Diameter:					
1st bearing	1.8715	1.8725			0.001
2d bearing	1.8085	1.8095			0.001
3d bearing	1.7457	1.7465			0.001
4th bearing	1.2465	1.2475			0.001
Camshaft Bearings					
Inside Diameter:					
1st bearing	1.8745	1.8755	0.002	0.004	
2d bearing	1.8115	1.8125	0.002	0.004	
3d bearing	1.7495	1.7502	0.002	0.004	
4th bearing	1.2495	1.2505	0.002	0.004	
Timing Gears:					
Backlash			0.0015	0.003	0.002
Valves					
Intake:					
Length		5 3/16 in.			
Head diameter		1 1/2 in.			
Seat angle		30°			
Stem diameter	0.3406	0.3414			

*Table 5-1*①. *Engine Repair Data, Model LE 300*—Continued

Component	Manufacturer's dimensions and tolerances in in.		Desired clearance		Maximum allowable wear and clearance
	Min	Max	Min	Max	
Wear limits, min dia					0.3386
Stem Clearance	0.008	0.0026		0.0015	0.0046
Exhaust:					
Length		5 3/16 in.			
Head diameter	1.307	1.317			
Seat angle		45°			
Stem diameter	0.3357	0.3385			
Wear limits, min dia					0.3357
Stem clearance	0.0037	0.0055		0.0045	0.0075
Valve Springs, od					
Valve closed:	1.130	1.150			
Spring length	1 21/32 in.				
Spring load	47 to 53 lb.				42 lb.
Valve open:					
Spring length	1 3/8 in.				
Spring load	103–110 lb.				93 lb.
Valves Guides, Intake & Exhaust:					
Length		2 5/16 in.			
Outside diameter	0.6565	0.6575			
Stem hole diameter	0.3422	0.3432			
Wear limits					0.3447
Distance-cylinder block contact face to guide.		1 15/32			
Cam Lifts:					
Intake		0.3290 in.			
Exhaust		0.3335 in.			
Tappet hole diameter	1.0000	1.0005			
Tappet diameter	0.9990	0.9995			
Camshaft clearance					0.0005—0.0015
Connecting Rods:					
Bushing hole diameter	0.913	0.914			
Bearing hole diameter	2.1865	2.1870			
Bearing thickness	0.6130	0.6155			
Wear limits minimum					0.0608
Crankpin diameter	2.0619	2.0627			
Wear limits minimum					2.0609
Clearance limits	0.0007	0.0025	0.0015	0.0015	0.0035
Side play	0.006	0.010			
Desired side play			0.006	0.006	
Pistons, Material					
Aluminum Alloy:					
Land diameter	3.4375	3.4395			0.008
Pin hole diameter	0.8592	0.8594			
Ring groove diameter	3.042	3.052			
Ring groove width					0.015
1st, 2d, 3d	0.1275	0.1285			0.1305
4th	0.252	0.253			0.2550
Fit in cylinder w/5- to 10-lb. pull		0.003			
Piston Rings Type					
No. 1-Chrome Plated					
No. 2-Scraper					
No. 3-4-Ventilated.					
Width:					
Nos. 1, 2, and 3	0.123	0.124			0.121
No. 4	0.2485	0.249			0.2465
Gap	0.007	0.017			

Table 5-1①. Engine Repair Data, Model LE 300—Continued

Component	Manufacturer's dimensions and tolerances in in.		Desired clearance		Maximum allowable wear and clearance
	Min	Max	Min	Max	
Side Clearance:					
No. 1	0.0035	0.005			
Nos. 2, 3	0.0035	0.0055			
No. 4	0.003	0.0045			
Weight compressed:					
Nos. 1, 3, and 4	7.5 lb.				
No. 2	6.5 lb.				
Piston Pins Fit in Piston;					
Light Push:					
Length	2.868	2.878			
Diameter	0.8591	0.8593			
Wear limits, minimum	----------	----------	----------	----------	0.8588
Bushing diameter	0.8595	0.8597			
Bushing fit	----------	----------	----------	----------	0.0004
Oil pump:					
Drive and idler gear to body	0.001	0.003	0.002	0.004	0.006
Drive shaft end play	0.0015	0.006			
Gear backlash	0.0030	0.0065			
Flywheel:					
Flange diameter	4.497	4.498			
Runout	----------	----------	----------	----------	0.008

Table 5-1②. Engine Repair Data, Model LEW 300

Component	Manufacturer's dimensions and tolerances in in.		Desired clearance		Maximum allowable wear and clearance
	Min	Max	Min	Max	
Cylinders:					
Diameter	3.4875	3.4895	0.005	0.065	0.008
Out-of-round	----------	0.002	----------	----------	0.007
Taper	----------	0.002	----------	----------	0.007
Main Bearings					
Bearing Type Insert:					
Case hole	2.56150	2.5622			
Bearing thickness	0.09250	0.09275	----------	----------	0.0920
Crankshaft size	2.3744	2.3752	----------	----------	2.3734
Clearance	----------	----------	0.0008	0.0028	
Crankshaft:					
End thrust	----------	----------	0.005	0.009	
Pulley fit diameter	1.434	1.4345			
Gear fit diameter	1.434	1.4345			
Main bearing journal fit diameter	2.2445	2.2445			
Crankpin	2.0619	2.0327	0.0007	0.0025	2.0609
Camshaft:					
Clearance limits	0.005	0.015	0.002	0.004	
End play	0.005	0.009			
Journal Diameter:					
1st bearing	1.8715	1.8725	----------	----------	0.001
2d bearing	1.8085	1.8095	----------	----------	0.001
3d bearing	1.7457	1.7465	----------	----------	0.001
4th bearing	1.2465	1.2475	----------	----------	0.001
Camshaft Bearings					
Inside Diameter:					
1st bearing	1.8745	1.8755	0.002	0.004	
2d bearing	1.8115	1.8125	0.002	0.004	

Table 5–1①. Engine Repair Data, Model LEW 300—Continued

Component	Manufacturer's dimensions and tolerances in in.		Desired clearance		Maximum allowable wear and clearance
	Min	Max	Min	Max	
3d bearing	1.7495	1.7502	0.002	0.004	
4th bearing	1.2495	1.2505	0.002	0.004	
Timing Gears:					
Backlash			0.0015	0.003	0.002
Valves					
Intake:					
Length		5 3/16 in.			
Head diameter		1 1/2 in.			
Seat angle		30°			
Stem diameter	0.3406	0.3414			
Wear limits, min dia					0.3386
Stem clearance	0.003	0.0026		0.0015	0.0046
Exhaust:					
Length		5 3/16 in.			
Head diameter	1.307	1.317			
Seat angle		45°			
Stem diameter	0.3357	0.3385		0.0045	0.0075
Wear limits, min dia					0.3357
Stem clearance	0.0037	0.0055			
Valve Springs, od	1.130	1.150			
Valve closed:					
Spring length	1 21/32 in.				
Spring load	47 to 53 lb.				42 lb.
Valve open:					
Spring length	1 3/8 in.				
Spring load	103–110 lb.				93 lb.
Valves Guides, Intake, and Exhaust:					
Length		2 5/16 in.			
Outside diameter	0.6565	0.6575			
Stem hole diameter	0.3422	0.3432			
Wear limits					0.3447
Distance-cylinder block contact face to guide.		1 15/32			
Cam Lifts:					
Intake		0.3290 in.			
Exhaust		0.3335 in.			
Lifter hole diameter	1.0000	1.0005			
Lifter diameter	0.9990	0.9995			
Camshaft clearance					0.0005—0.0015
Connecting Rods:					
Bushing hole diameter	0.913	0.914			
Bearing hole diameter	2.1865	2.1870			
Bearing thickness	0.6130	0.6155			
Wear limits minimum					0.0608
Crankpin diameter	2.0619	2.0627			
Wear limits minimum					2.0609
Clearance limits	0.0007	0.0025	0.0015	0.0015	0.0035
Side play	0.006	0.010			
Desired side play			0.006	0.006	
Pistons, Material					
Aluminum Alloy:					
Land diameter	3.4375	3.4395			0.008
Pin hole diameter	0.8592	0.8594			
Ring groove diameter	3.042	3.052			
Ring groove width					0.015
1st, 2nd, 3rd	0.1275	0.1285			0.1305
4th	0.252	0.253			0.2550

Table 6-1①. Engine Repair Data, Model LEW 800—Continued

Component	Manufacturer's dimensions and tolerances in in.		Desired clearance		Maximum allowable wear and clearance
	Min	Max	Min	Max	
Fit in cylinder w/5 to 10 lb pull		0.003			
Piston Rings Type					
No. 1-Chrome Plated					
No. 2-Scraper					
No. 3-4-Ventilated.					
Width:					
Nos. 1, 2, and 3	0.123	0.124			0.121
No. 4	0.2485	0.249			0.2465
Gap	0.007	0.017			
Side Clearance:					
No. 1	0.0035	0.005			
Nos. 2, 3	0.0035	0.0055			
No. 4	0.003	0.0045			
Weight compressed:					
Nos. 1, 3, and 4	7.5 lb				
No. 2	6.5 lb				
Piston Pins Fit in Piston; Light Push:					
Length	2.868	2.878			
Diameter	0.8591	0.8593			
Wear limits, minimum					0.8588
Bushing diameter	0.8595	0.8597			
Bushing fit					0.0004
Oil Pump:					
Drive and idler gear to body	0.001	0.003			
Drive shaft end play	0.0015	0.006	0.002	0.004	0.006
Gear backlash	0.0030	0.0065			
Flywheel:					
Flange diameter	4.497	4.498			
Runout					0.008

Table 5-1③. Engine Repair Data, Model LEB 300

Component	Minimum Inches	Desired Inches	Maximum Inches	Additional allowance wear or clearance
Cylinder Block:				
Cylinder Out-of-round			0.0005	
Cylinder Taper			0.0005	
Crankshaft and Bearings:				
Crankshaft Main Journal Diameter	2.2442		2.2457	0.001
Crankshaft Rod Journal Diameter	2.0594		2.0610	0.001
Main Bearing Clearance	0.0008	0.0015	0.0028	
Bearing Thickness	0.0948		0.0953	0.0005
Crankshaft End Thrust	0.002		0.006	
Main Bearing Size (case hole)	2.4365		2.4372	
Out-of-Round			0.0005	
Taper			0.0005	
Runout			0.002	
Connecting Rods and Bearings:				
Bearing Thickness	0.0623		0.0628	
Bearing Length	1.057		1.067	
Side Play	0.006		0.010	
Connecting Rod Bend	0.000		0.002	
Crankshaft Journal to Connecting rod bearing Clearance.	0.003		0.008	
Connecting Rod Twist	0:000		0.002	
Pin Bushing Inside Diameter	0.8593	0.8596	0.8596	
Pin Bushing Outside Diameter	0.9165		0.9185	
Bearing Outside Diameter	2.1865		2.1870	
Pin Bushing Length	2.17		1.19	
Pin Bushing Thickness	0.0345		0.0365	
Bearing Inside Diameter	2.0609		2.0624	
Pistons:				
Ring Land Clearance	0.028		0.035	
Skirt Clearance		0.0015		
Taper of Skirt	0.0005	0.001	0.0015	
Pin Hole Diameter	0.8593		0.8593	
Piston Pins:				
Pin Diameter	0.8591		0.8593	0.001
Desired Fit in Bushing	0.0000	0.00025	0.0005	
Desired Fit in Piston at 70°F.	0.0001		0.0003	
Pin Length	2.738		2.753	
Piston Rings:				
Cylinder Diameter	3.4375		3.4395	
Width-Top Chrome	0.0930		0.0940	
Width-2d Groove	0.0930		0.0940	
Width-3d and 4th Grooves	0.1545		0.1555	
Thickness, Top, Chrome	0.162		0.172	
Thickness, 2nd Groove	0.143		0.153	
Thickness, 3rd & 4th Grooves	0.143		0.153	
Gap Clearance-Top Chrome	0.010		0.020	
Gap Clearance-2d Groove	0.010		0.020	
Gap Clearance-3d & 4th Grooves	0.010		0.020	
Side Clearance-Top Rings	0.002		0.004	
Side Clearance-2d Rings	0.0015		0.0035	
Side Clearance-3d & 4th Rings	0.001		0.003	
Weight Compressed, Top		7⅛ lbs		
Weight Compressed, 2d		6⅛ lbs		
Weight Compressed, 3d & 4th Groove		7⅛ lbs		
Camshaft:				
Journal Size (front)	1.8715		1.8715	0.002
Journal Size (inter. front)	1.8085		1.8095	0.002
Journal Size (inter. rear)	1.7457		1.7465	0.002

Table 5-1①. Engine Repair Data, Model LEB 300—Continued

Component	Minimum Inches	Desired Inches	Maximum Inches	Additional allowance wear or clearance
Journal Size (rear)	1.2465		1.2475	0.002
Intake Lift		0.3115		
Exhaust Lift		0.3160		
End Thrust	0.005		0.009	
Camshaft Bushings:				
Inside Diameter (front)	1.8745		1.8755	0.002
Clearance (front)	0.002		0.004	
Inside Diameter (inter. front)	1.8115		1.8125	0.002
Clearance (inter. front)	0.002		0.004	
Camshaft Bushings—Continued				
Inside Diameter (inter. rear)	1.7495		1.7502	0.002
Clearance (inter. rear)	0.003		0.0045	
Inside Diameter (rear)	1.2495		1.2505	0.002
Clearance (rear)	0.002		0.004	
Valves and Springs:				
1. Intake Valves				
Stem Diameter	0.3405		0.3415	0.002
Head Diameter	1.495		1.505	
Overall Length	5.1745		5.2895	
Valve Face		0.124		
Valve Tappet Clearance (hot)		0.014		
Stem in Guide Clearance	0.0017		0.0037	0.002
Valve Seat Angle		45°		
Valve Seat Width		0.066		
Valve Spring Free Length		2 1/16		
Valve Spring Outside Diameter		3 1/32	3 1/32	
Valve Spring Wire Size		0.142	0.142	
Spring Length (Valve Closed)			1 45/64	
Valve Spring Load in Pounds at Closed Length	47		53	
2. Exhaust Valves				
Stem Diameter	0.3405		0.3415	0.002
Head Diameter	1.307		1.317	
Overall Length	5.1745		5.2895	
Valve Face		0.124		
Valve Tappet Clearance (hot)		0.014		
Stem in Guide Clearance	0.0037	0.0045	0.0057	
Valve Seat Angle		45°		
Valve Seat Width		0.085		
Valve Spring Free Length			2 1/16	
Valve Spring Outside Diameter			31/32	
Valve Spring Wire Size			0.142	
Spring Length (Valve Closed)			1 45/64	
Valve Spring Lead in Pounds at Closed Position	50		53	
Valve Tappets:				
Valve Tappet Diameter	0.999		0.9995	
Valve Tappet Clearance in Guide	0.0015		0.0005	
Valve Guides:				
Distance from Top of Cylinder to Top of Guide		1 15/32		
Stem Hole Diameter (Intake)	0.3432		0.3442	0.0015
Stem Hole Diameter (Exhaust)	0.3452		0.3462	0.0015
Length		2 5/16		
Outside Diameter	0.6565		0.6574	
Valve Timing:				
Intake Valves Open Before Top Dead Center		4 1/2°		
Crankshaft Rotation Piston Travel-Distance from Mean Top of Crankcase to Mean Top of Piston at 4 1/2° BTDC.		0.0134		

Table 5-1①. Engine Repair Data, Model LEti 800—Continued

Component	Minimum Inches	Desired Inches	Maximum Inches	Additional allowance wear or clearance
Timing Gears Backlash	0.001	....	0.003	
Cylinder Head				
Cylinder Head Warpage Crosswise	....	....	0.003	
Cylinder Head Warpage Lengthwise	....	....	0.004	
Oil Pump				
Clearance Between End of Gear Teeth and Body	0.002	....	0.004	
Backlash to Camshaft Gear	....	....	0.003	
Lash Between Gears	0.001	....	0.003	

Section III. REPAIR PARTS, SPECIAL TOOLS, AND EQUIPMENT

5-5. Special Tools and Equipment

No special tools or equipment are required to perform direct and general support and depot maintenance on the arc welding machine.

5-6. Direct Support, General Support, and Depot Maintenance Repair Parts

Direct and General and Depot Maintenance Repair Parts are listed and illustrated in TM 5-3431-205-35P.

5-7. Specially Designed Tools and Equipment

No specially designed tools or equipment are required to perform direct and general support and depot maintenance on the arc welding machine.

Section IV. TROUBLESHOOTING

5-8. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the arc welding machine or any of its components. Malfunctions which may occur are listed in table 5-2. Each malfunction stated is followed by a list of probable causes of the trouble. The corrective action recommended is described opposite the probable cause.

Table 5-2. Troubleshooting

Malfunction	Probable cause	Corrective action
1. Engine hard to start or fails to start.	a. Valves burned or sticking	a. Repair or replace valves (para 6-11).
	b. Valve springs weak or broken	b. Replace valve springs (para 6-11).
	c. Cylinder compression low	c. Replace worn pistons or piston rings (para 6-10).
	d. Defective magneto	d. Repair magneto (para 6-6).
	e. Defective engine speed governor	e. Repair, adjust or replace governor (para 6-1).
2. Engine exhaust smoky	a. Pistons or rings worn or defective	a. Replace pistons and rings (para 6-10).
	b. Valve stems and guides worn excessively.	b. Replace valves and guides (para 6-11).
3. Engine lubricating oil consumption high.	a. Piston rings worn or broken	a. Replace piston rings (para 6-10).
	b. Pistons worn or broken	b. Replace pistons (para 6-10).
	c. Main bearings worn	c. Replace bearings (para 6-10).
	d. Valve guides and stems worn	d. Replace guides (para 6-11).
	e. Oil leaks at seals and gaskets	e. Correct oil leaks.

Table 5-8. Troubleshooting —Continued

Malfunction	Probable cause	Corrective action
4. Engine lubricating oil pressure low.	a. Oil pump defective	a. Repair or replace pump (para 6-9).
	b. Main bearings worn	b. Replace bearings (para 6-10).
	c. Oil pump screen clogged	c. Remove and clean screen (para 6-9).
5. Engine noisy	a. Main bearings worn	a. Replace defective bearings (para 6-10).
	b. Connecting rod bearings worn	b. Replace bearings (para 6-10).
	c. Piston pins loose	c. Replace piston pins (para 6-10).
	d. Piston rings broken	d. Replace rings (para 6-10).
	e. Timing gear loose or broken	e. Replace timing gear (para 6-10).
	f. Crankshaft journals out-of-round	f. Repair or replace crankshaft (para 6-10).
	g. Flywheel loose	g. Tighten flywheel bolts (para 6-10).
	h. Valves out of adjustment	h. Adjust valves (para 6-11).
	i. Connecting rod misaligned	i. Realign connecting rod (para 6-10).
6. Engine overheats	a. Oil pump defective	a. Repair or replace pump (para 6-9).
	b. Radiator defective	b. Repair radiator (para 6-8).
7. Engine lacks power	a. Magneto defective	a. Repair or replace magneto (para 6-6).
	b. Engine speed governor defective	b. Adjust, repair or replace governor as necessary (para 6-1).
	c. Valves burned or sticking	c. Repair or replace valves (para 6-11).
	d. Piston rings worn or broken	d. Replace piston rings (para 6-10).
	e. Magneto out of adjustment	e. Adjust magneto (para 6-6).
8. Engine misses or runs erratically.	a. Magneto defective	a. Repair or replace magneto (para 6-6).
	b. Engine speed governor defective	b. Adjust, repair, or replace governor as necessary (para 6-1).
	c. Valves burned, warped or sticking	c. Repair or replace valves (para 6-11).
	d. Valve spring weak or broken	d. Replace valve springs (para 6-11).
9. Engine vibrates excessively	a. Flywheel or housing loose	a. Tighten mounting hardware (para 6-10).
	b. Engine mounts loose	b. Tighten mounts.
10. Engine stops suddenly	a. Piston broken	a. Replace piston (para 6-10).
	b. Connecting rod broken or bent	b. Replace connecting rod (para 6-10).
	c. Connecting rod bearings worn and overlapped.	c. Replace bearings (para 6-10).
	d. Engine speed governor defective	d. Adjust, repair or replace as necessary (para 6-1).
	e. Magneto defective	e. Adjust, repair or replace as necessary (para 6-6).
11. Starter fails to crank engine.	a. Commutator worn or high mica	a. Repair the commutator or replace armature (para 6-4).
	b. Shaft bearings frozen	b. Replace the bearings (para 6-4).
	c. Armature defective or shaft bent	c. Replace armature (para 6-4).
	d. Field coil defective or pole loose	d. Replace field coil (para 6-4). Tighten loose pole screws (para 6-4).
	e. Flywheel ring gear stripped	e. Replace (para 6-10).
	f. Starter drive assembly defective	f. Repair or replace starter drive assembly (para 6-4).

Table 5-8. Troubleshooting—Continued

Malfunction	Probable cause	Corrective action
	g. Weak battery h. Starter solenoid defective	g. Check battery and connections (para 6-18). h. Repair or replace solenoid (para 6-4).
12. Engine generator charging rate improper.	a. Worn or sticking brushes b. Rough, dirty, or greasy commutator. c. Bearings defective d. Voltage regulator defective e. Open or short circuit in generator	a. Clean or replace brushes (para 3-36). b. Clean and repair commutator (para 6-3). c. Replace bearings (para 6-8). d. Check or replace (para 3-37). e. Repair or replace generator (para 6-3).
13. Welding generator overheats.	a. Station windings shorted or grounded. b. Field windings defective c. Bearings defective	a. Replace starter housing (para 6-13). b. Replace field (para 6-13). c. Replace field (para 6-14).
14. Welding generator delivers excessive voltage.	a. Field defective b. Stator defective	a. Replace field (para 6-13). b. Replace stator (para 6-13).
15. Welding generator noisy	a. Generator bearings defective b. Field coil loose	a. Replace bearings (par 6-13. b. Replace coil (para 6-13).
16. Welding generator fails to build up to rated voltage.	a. Armature defective b. Field coil defective c. Commutator dirty, greasy or worn. d. Worn brushes	a. Repair or replace armature (para 6-13). b. Repair or replace coil (para 6-13). c. Clean or repair commutator (para 6-13). d. Replace brushes (para 3-64).
17. Heater starts and runs but goes out later.	a. Restriction in coolant flow b. Defective overheat switch	a. Remove restriction. b. Replace switch (para 6-19).
18. Heater overheats	a. Defective fuel solenoid valve b. Defective overheat switch c. Restriction in coolant flow	a. Replace valve (para 6-19). b. Replace switch (para 6-19). c. Remove restriction.
19. Heater output low	Defective fuel solenoid valve	Replace valve (para 6-19).
20. Heater smokes excessively	Leaking fuel solenoid valve	Replace valve (para 6-19).
21. Heater blower will not stop when heater is shut off.	Defective flame detector switch	Replace quartz rod, reset, or replace switch.
22. Heater will not start, blower does not run.	Defective blower	Replace blower (para 6-20).
23. Heater blower runs when switch is in "ON" position, but heater will not ignite.	a. Defective igniter b. Defective fuel solenoid valve c. Defective overheat switch d. Defective preheater resistor	a. Replace igniter (para 6-19). b. Replace valve (para 6-19). c. Replace switch (para 6-19). d. Replace resistor (para 6-19).
24. Heater runs when switch is in "ON" position and heater ignites, but pilot lamp will not light.	Defective flame detector switch	Replace or reset switch, (para 6-19).

Section V. RADIO INTERFERENCE SUPPRESSION

5–9. General

a. Refer to TM 11–483 for definitions, purpose, source and methods used to obtain proper radio suppression.

b. Refer to chapter 3, section VI for identification and replacement of interference suppression components.

Section VI. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS

5–10. General

The arc welding machine is so constructed that removal of a major component is impractical without complete disassembly of some of the components. For example; the welding generator cannot be removed unless the enclosure is disassembled and the generator completely disassembled.

CHAPTER 6

REPAIR INSTRUCTIONS

Section I. FUEL SYSTEM

6-1. Governor

a. Disassembly.

(1) Refer to paragraph 3-28 to remove and install the governor.

(2) Remove governor-to-carburetor rod (1, fig. 6-1) from lever (37) by unscrewing ball joint (2). Remove lockwasher (3). Nuts (4) are not changed unless change in length of rod is required. If governor is not being removed in normal order disassembly, disconnect governor-to-carburetor rod at carburetor end as well as to governor end.

(3) Remove screw (5) together with gasket (6), plate (7) and gasket (8).

(4) Remove screw and lockwasher assembly (9) and carefully disengage governor from gear cover. Remove gasket (10).

(5) Remove main shaft and weights assembly after removing attaching screw (11).

(6) Press out two flyweight pivot pins (12) after removing retainers (13), then lift flyweights (14) from yoke.

(7) Remove sleeve and bearing assembly from shaft and separate three-piece bearing (15) from sleeve (17) after removing retainer (16).

(8) Pull yoke (18) together with bearing and cover assembly (19) from shaft and gear assembly (20) with suitable puller.

(9) Lift out rocker shaft lever (21) after removing two attaching screw and lockwasher assemblies (22).

(10) Pull speed adjusting and throttle lever assembly from shaft (45) after removing attaching screw (23), lockwasher (24), bushing (25), and pin (26).

(11) Disengage springs (30) from link (27) and separate link (27) together with washer (29) after removing retainer (28).

(12) Remove two springs (30) from lever (31).

(13) Separate nut (32), lockwasher (33), flat washer (34), and pin (35).

(14) Separate spring (36) from lever (37).

(15) Remove spacer (38), seal (39) and spacer (40) from end of shaft, then strike same end of shaft sharply to dislodge welch plug (41).

(16) Remove retainer (42) and use shaft (45) to drive bearings (43) and (44) from outer side of housing.

(17) Screw (46) and nut (47) are set and sealed at the factory and are not normally removed or readjusted.

(18) Name plate (48) and attaching screws (49) need not be removed from body (50) for normal cleaning and inspection.

b. Cleaning. Clean all metal parts except bearing (15), bearing cover (19), bearings (43 and 44) and seal (39) in solvent and dry thoroughly. Wipe dirt and excess grease from bearings and seal with clean, lint-free cloth.

c. Inspection. Inspect bearings (15, 19, 43 and 44) for wear or scoring. Inspect shaft (45), pin (12), and shaft and gear (20) for wear or scoring. Inspection bearing surfaces in weights (14) and yoke (18) for wear and scoring. Inspect rod (1) for straightness and ball joints (2) for looseness and excessive wear. Do not change length of rod unless necessary.

d. Repair. Straighten rod (1) if bent. Tighten ball joints (2) to eliminate excessive play. Replace any other parts which do not pass inspection.

e. Reassembly. To reassemble the governor and rod assembly, proceed as follows:

(1) Press bearing (43) on shaft (45). Insert shaft and bearing in body (50), lay on side, brace shaft, and press bearing (44) on shaft.

(2) Install retainer (42)and plug (41).

(3) Insert spacer (40), seal (39) and spacer (38) on shaft (45).

(4) Install lever (37) on shaft (45) and insert pin (26). If removed, install spring (36) on lever (37). Install pin (35), flat washer (34), lockwasher (33) and nut (32) on lever (37).

(5) Install lever (31) on body (50 with attaching brushing (25), lockwasher (24) and screw (23).

(6) Slide washer (29), and link (27) on pin (35) and clip on retainer (28). Clip springs (30) on lever (31) and on link (27).

(7) Attach rocker shaft lever (21) to shaft (45) inside body with two attaching screw and washer assemblies (22).

(8) Press bearing and cover assembly (19) on shaft and gear assembly (20).

(9) Press yoke (18), sleeve (17) and three-piece bearing (15) on shaft and gear assembly (20). Secure with retainer (16).

(10) Assemble weights (14) to yoke (18) and secure by pressing pin (12) through Yoke (18) and clipping on retainers (13).

(11) Tilt governor housing back so that shaft lever (21) is raised and insert shaft and weights assembly. Secure shaft and weights assembly with screw (11).

(12) If gasket (10) is damaged, replace before attaching governor to gear cover.

f. Installation.

(1) Install governor on gear cover making sure gasket (10) is proper seated. Attach governor with screw and lockwasher (9) at bottom, and governor-to-magneto screw (5) with gasket (6), plate (7), and gasket (8) at top.

(2) Attach governor-to-carburetor rod (1) by screwing ball joint nut (2) and washer (3) into threaded hole on lever (37).

(3) Operate lever (37) by hand to check binding of governor parts. If removed, install name plate (48) with attaching screws (49), and adjusting screw (46) and nut (47). If screw (46) and nut (47) have been removed, governor speed adjustment must be readjusted with engine operating.

g. Adjustments. The three governor adjustments are the speed adjusting screw (fig. 6–1) sensitivity pin, and length of governor rod. In addition, the governor end of the governor rod should be free to move toward the radiator to its maximum position without any part of the mechanism striking the radiator case. Bend the radiator case slightly if necessary. To set the governor adjustments, proceed as follows:

(1) Loosen lock nut on engine side of sensitivity pin and turn head of pin clockwise with screwdriver to maximum position. Tighten lock nut.

(2) If necessary to change length of governor rod, unscrew ball joint of governor rod from either governor or carburetor. Adjust length of rod by screwing ball joint housing along rod until rod just fits between arm on governor shaft in straight position and throttle shaft clamp in maximum clockwise position.

(3) Push idling regulator rod toward carburetor and pin in full-throttle position with latch pin.

(4) Connect tachometer to end of exciter shaft or shine stroboscope light on marked shaft.

(5) Connect welding cables to machine and clip electrode holder and ground clamp to piece of scrap metal so that machine is operating under load.

(6) Loosen lock nut on speed adjusting screw (7) and set speed adjusting screw for generator shaft speed of 1450 rpm.

(7) Tighten locking nut.

(8) Recheck speed setting after welding controls and generator have been tested.

(9) Thread lock wire through hole in head of adjusting screw and around ear on governor. Twist lock wire snugly and cut off free ends.

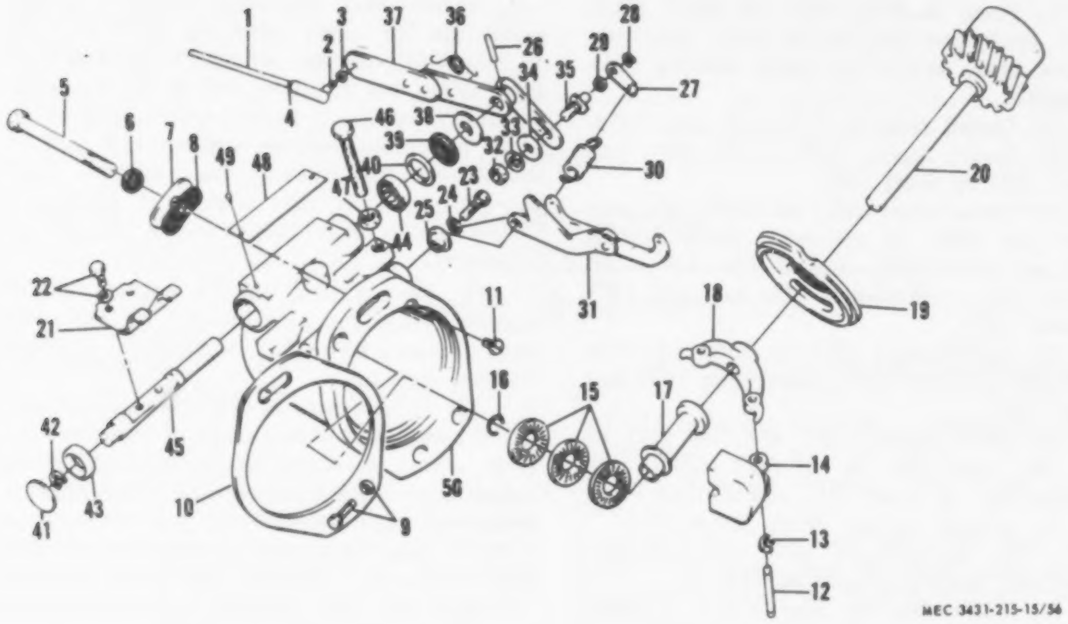
6–2. Fuel Tank

a. Removal and Installation. Refer to paragraph 3–23 to remove and install the fuel tank.

b. Disassembly.

(1) If fuel tank is not empty, attach a flexible fuel line to drain cock (12, fig. 6–2) and empty contents of tank into a convenient container.

(2) Remove fuel cap (1) after removing retaining chain (4) and retaining pin (3).



1	Rod
2	Ball joint
3	Lockwasher
4	Nut
5	Screw
6	Gasket
7	Plate
8	Gasket
9	Screw
10	Gasket
11	Screw
12	Pin
13	Retainer
14	Flyweight assembly
15	Bearing
16	Retainer
17	Sleeve
18	Yoke
19	Bearing and cover
20	Shaft and gear
21	Rocker shaft lever
22	Screw
23	Screw
24	Lockwasher
25	Bushing
26	Pin
27	Spring link
28	Retainer
29	Washer
30	Speed adjusting spring
31	Speed adjusting lever
32	Nut
33	Lockwasher
34	Washer
35	Sensitivity adjusting pin
36	Spring
37	Throttle lever
38	Spacer
39	Seal
40	Spacer
41	Plug
42	Retainer
43	Bearing
44	Bearing
45	Rocker shaft
46	Speed adjusting screw
47	Nut
48	Nameplate
49	Screw
50	Body

Figure 6-1. Governor, assembly and disassembly.

(3) Remove fuel cap strainer (2) from fuel tank.

(4) Disconnect electrical lead at fuel transmitter by removing nut (5) and washer (6).

(5) Carefully lift out fuel transmitter (10) after removing attaching screws (7), washers (8) and nuts (9).

(6) Unscrew and remove fuel drain cock (12).

(7) Remove fuel line (14).

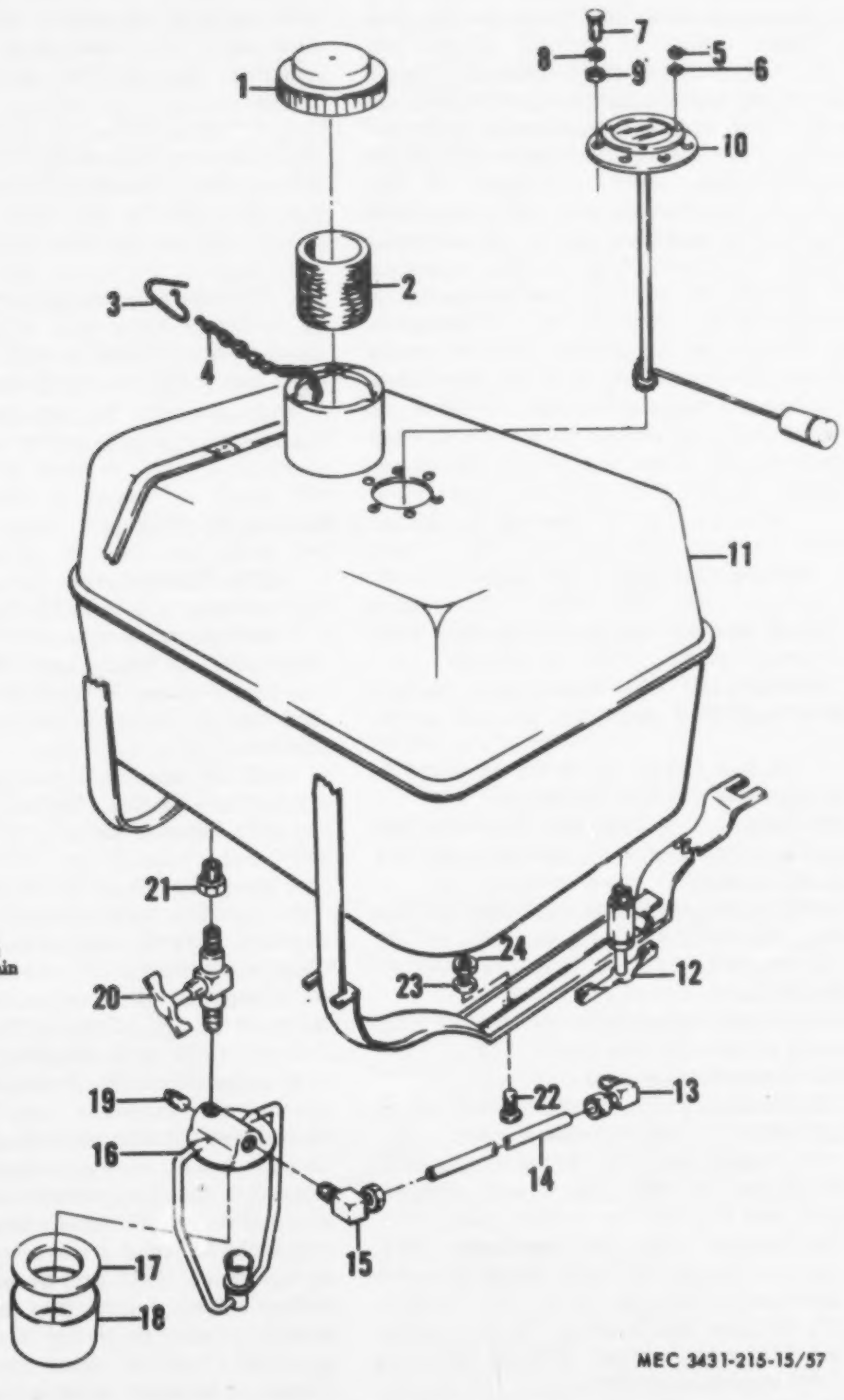
(8) Unscrew and remove elbow (15) from filter frame.

(9) Loosen thumbscrew on filter frame and remove fuel bowl (18) and gasket (17).

(10) Unscrew and remove fuel filter frame (16).

(11) Unscrew and remove elbow (13), shutoff cock (20) and bushing (21).

(12) Remove fuel tank (11) after remov-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1	Fuel cap
2	Strainer
3	Retaining pin
4	Retaining chain
5	Nut
6	Washer
7	Screw
8	Washer
9	Nut
10	Transmitter
11	Tank
12	Drain cock
13	Elbow
14	Fuel line
15	Elbow
16	Filter
17	Gasket
18	Bowl
19	Plug
20	Shut-off cock
21	Bushing
22	Screw
23	Washer
24	Nut

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Figure 6-2. Fuel tank, assembly and disassembly.

ing attaching screws (22), washers (23) and nuts (24).

c. Cleaning. Clean filter assembly, bushings, nipples, and connecting hardware in solvent and dry with compressed air, Blow out fuel line (14) with compressed air. Steam clean tank (11).

d. Inspection. Inspect tank (11) for leaks or cracks and holddown straps for corrosion or breaks. Use small flashlight to inspect interior of tank for corrosion and sediment. Inspect cap (1) and strainer (2) for good condition and proper fit. Inspect float for leaks and transmitter assembly (10) for free movement. Connect ohmmeter from terminal to mounting plate and slowly move arm through complete range. Note smooth change of resistance from one end to other. Inspect elbow connectors (15) and elbow (13) for thread condition. Inspect filter assembly for good condition.

e. Repair. Solder or weld holes in tank (11). Replace any defective hold-down straps with crating strapping. Remove any kinks in line (14) but do not deform from designed shape. Replace any other parts which do not pass inspection.

Warning: **Before performing any welding or soldering operations on fuel tank, steam clean tank continuously with live steam for at least two hours to eliminate explosive vapors.**

f. Reassembly. To reassemble, reverse the disassembly procedure.

Section II. ENGINE ELECTRICAL SYSTEM

6–3. Battery Charging Generator

a. Removal and Installation. To remove and install battery charging generator refer to paragraph 3–36.

b. Disassembly. To disassemble battery charging generator assembly, proceed as follows:

(1) Remove cover band (1, fig. 6–3) by removing screw (2) and nut (3).

(2) Remove cable clamp (4), then disconnect wires (5 and 6) from connector (7). Remove connector.

(3) Remove receptacle assembly (8) by removing screw and lockwasher (9).

(4) Remove clips (10 and 11) from receptacle (8).

(5) Remove receptacle elbow (12) after removing screw and lockwasher (13).

(6) Remove spacer (14).

(7) Remove frame assembly (15) by removing bolt (16) and lockwasher (17).

(8) Remove arm (18), brush spring (19), and brush washer (20) from frame assembly (15).

(9) Remove brush lead insulation (21), then remove brush (22) by removing screw and lockwasher (23).

(10) Remove ball bearing (24).

(11) Remove armature (25) by removing nut (26) and washer (27).

(12) Remove collar (28), key (29), bearing retainer plate (30) and ball bearing (31).

(13) Remove static ground collector (32) by removing screw and lockwasher (33).

(14) Remove screw (35) attaching pole shoe (34) to frame (40). Remove pole shoe.

(15) Remove receptacle lead screw (36) and field coil lead to ground screw and lockwasher (37).

(16) Remove field coil assembly (38) and field coil insulation (39).

(17) Remove dowel pin (41) from frame (40).

c. Cleaning. Clean all parts except bearings (24 and 31), armature (25), brushes (22) and coil (38) in solvent and dry thoroughly. Clean commutator of armature (25) with No. 00 sandpaper. Blow off with compressed air. Wipe off bearings (24 and 31), armature (25), and coil (38), with clean link-free cloth.

d. Inspection. Check brushes against new brushes for excessive wear. If brushes are worn more than ½ of original length, replace. Inspect brush springs, arms, and mounting stop pins for good condition. Inspect inside of cover band (1) for signs of thrown solder and coil (38) and armature (25) for burned or blackened insulation or loose windings. If indication of overheating is observed, test armature and field for shorts, opens, and grounds. Check for open field with test lamp connected between terminal lugs. If lamp fails to light, check for visible open lead to solder. If open is apparently within coil, replace coil.

Check for shorted field by measuring between terminal lugs with low-range ohmmeter. Resistance should be approximately one ohm. Check for grounded field can only be made with field coils installed, but grounded field indicates breakdown of coil insulation which may be visible on close inspection. Check for open armature coil by inspecting commutator bars for burned areas. Bar to which open coil should be connected will be burned by arc each time it passes under brush. Check for short circuit in armature with growler and thin strip of steel such as hacksaw blade. Place armature in growler and rotate slowly while holding steel strip over top. Steel strip will vibrate above area of armature core in which shorted armature coils are located. If short is visible at ends of core laminations it may be possible to repair it. Check for grounded commutator coil with test lamp. Place one test point on shaft and other test point on end of each commutator segment in turn. Do not touch face of commutator bars with test point. Lamp should not light at any test point. Inspect commutator for roughness, high mica, and out-of-round condition. If very slightly rough, commutator can be reconditioned with No. 00 sandpaper. For correction of other conditions, turn commutator down in lathe until commutator is smooth and concentric with shaft, then undercut mica to depth of $^{1}/_{16}$ inch. Remove any burned edges with No. 00 sandpaper. Check bearings (24 and 31).

e. Repair. Replace brushes if worn more than ½ length of new brush. Replace armature (25) or field coil (38) which are defective and cannot be easily repaired. Turn down commutator in lathe if rough or out-of-round and undercut mica to depth of $^{1}/_{16}$ inch if high. Replace all other parts which do not pass inspection.

f. Reassembly. To reassemble, reverse the disassembly procedure.

g. Adjustment. After battery-charging generator has been reassembled, polarize generator to insure correct polarity of output. Connect generator on test stand to voltage regulator and battery with which generator is to be used. Before rotating generator, connect jumper lead momentarily between GEN and BAT terminals of voltage regulator. Momentary surge of current will correctly polarize generator. This procedure is important to prevent damage to system after generator builds up voltage. To test generator, connect 0–5 ampere ammeter in series with lead to FLD terminal of generator and 0–50 ampere ammeter in series with lead to ARM terminal. Connect 0–50 volt voltmeter from FLD terminal to generator frame and 0–50 volt voltmeter from ARM terminal to generator frame. Connect low-resistance high-wattage variable resistance from ARM terminal to frame through heavy-duty knife switch. Disconnect generator from voltage regulator. Rotate generator at speed sufficient to build up voltage at FLD terminal to exactly 24 volts. At this point ammeter should indicate between 0.94 and 1.02 amperes at room temperature. Change speed if necessary to 1900 rpm and close knife switch. Adjust resistor for current of 18.0 amperes in ARM lead. Voltmeter from ARM terminal to frame should indicate 25.8 to 26.2 volts.

6–4. Starter Motor and Solenoid Switch (Model LEB 300)

a. Removal and Installation. Refer to paragraph 3–34 to remove and install the starter motor and solenoid.

b. Disassembly.

(1) Disconnect leads to solenoid and remove solenoid (17, fig. 6–4) from starter by removing screws (35) and lockwasher (27).

(2) Remove cover (10, fig. 6–5) by removing attaching hardware, then remove insulator (9), spring (7), contact (8) and contact and push rod (6) from housing (1).

(3) Remove frame (1, fig. 6–4) by removing thru bolts (37), then remove housing (16).

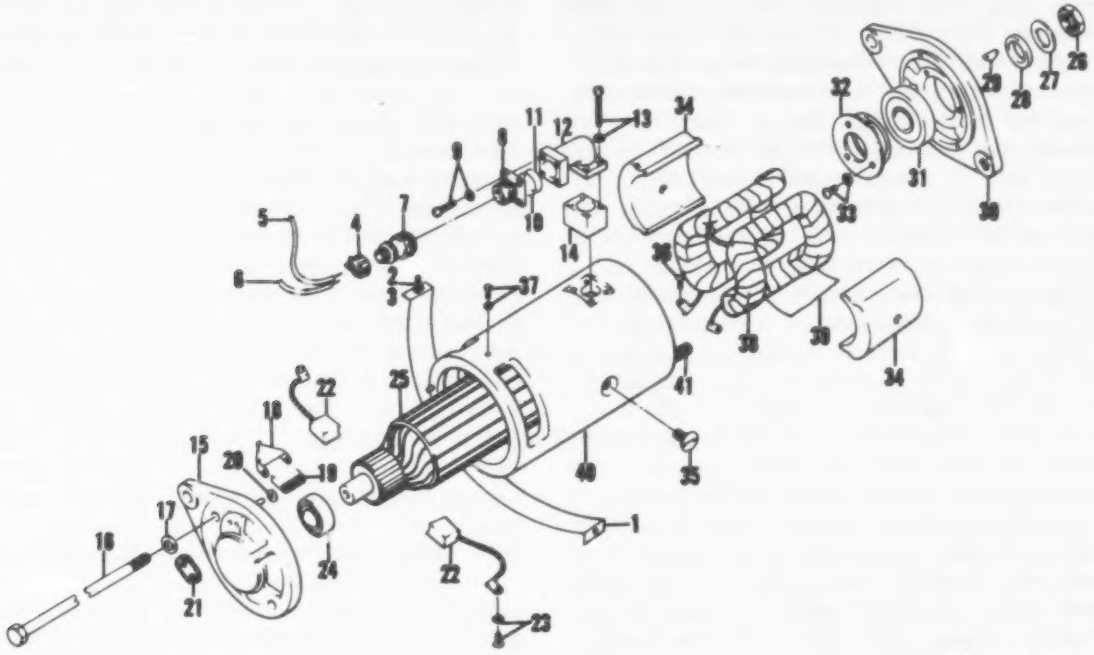
(4) Remove spring (18) and plunger (19) from shift lever (20). Remove shift lever (20) from housing (16) by removing stud (22), washer (26) and nut (29).

(5) Remove armature (10) from housing (38), then remove collars (13 and 15), ring (14), drive assembly (12) and spring (11).

(6) Remove pole shoes (44) by removing screws (34), then remove field coil (8) and shunt coil (9).

(7) Remove brush holders (3 and 4), spring (5), support (6) and lead (7).

c. Cleaning. Clean studs, nuts and metal washers; spacer, and frame, drive assembly, housing and frame in solvent and dry thoroughly. Wipe off solenoid case and plunger with solvent-dampened cloth and dry with clean, lint-free cloth. Clean commutator with No. 00 sandpaper and finish cleaning with vacuum line.



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1	Cover band	22	Brush
2	Screw	23	Screw and lockwasher
3	Nut	24	Ball bearing
4	Cable clamp	25	Armature
5	Wire	26	Nut
6	Wire	27	Washer
7	Connector	28	Collar
8	Receptacle	29	Key
9	Screw and lockwasher	30	Plate
10	Clip	31	Ball bearing
11	Clip	32	Collector
12	Elbow	33	Screw and lockwasher
13	Screw and lockwasher	34	Shoe
14	Spacer	35	Screw
15	Frame assembly	36	Screw
16	Bolt	37	Screw and lockwasher
17	Lockwasher	38	Coil
18	Arm	39	Insulation
19	Spring	40	Frame
20	Washer	41	Pin
21	Insulation		

Figure 6–3. Battery charging generator, assembly and disassembly.

d. Inspection. Inspect brushes, brush holders, coil assemblies and armature in similar manner to that outlined for similar parts of battery-charging generator in paragraph 6–8. Inspect bearing surfaces of bushings for wear and scoring. Inspect drive assembly gears for wear and chipped or broken teeth and spring for general condition. Inspect studs for burned or otherwise damaged threads. Inspect contact disc for pitted or burned spots.

e. Repair. Replace any parts which do not pass inspection. If drive gear must be replaced, camshaft will probably need replacement also.

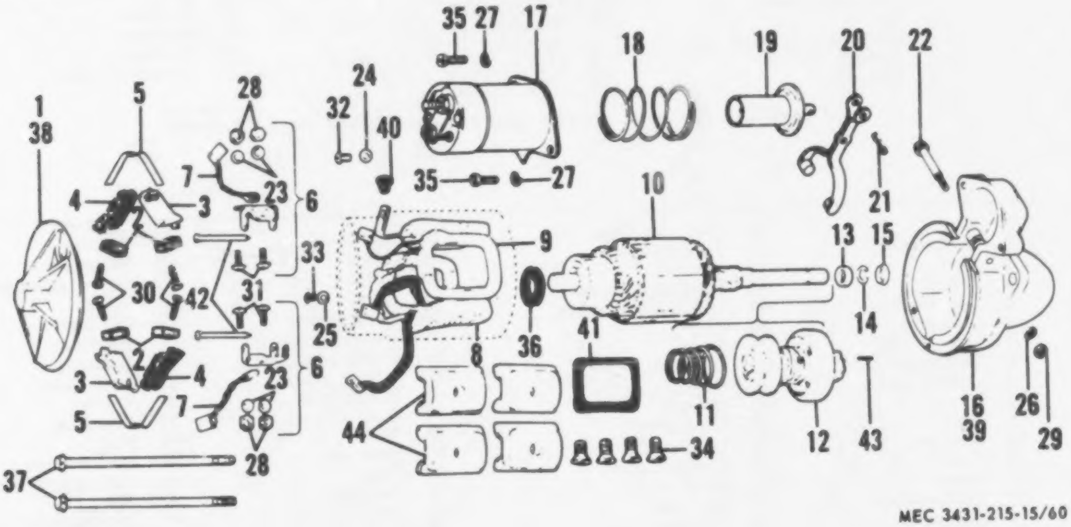
f. Reassembly. To reassemble solenoid

switch and starting motor, reverse disassembly procedure.

g. Adjustments.

(1) Subject starter motor to no-load and lock-torque test using equipment shown in fig. 3–19. For no-load test, connect motor in series with battery with which motor will be installed, ammeter capable of reading 500 amperes, and low-resistance, high-wattage, variable resistor. With brake arm disconnected and with 23.5 volts applied to input terminal, motor should rotate at 2,500 rpm and should draw maximum of 35 amperes. For lock test connect brake arm to starter pinion and apply 19.1 volts to input terminal. Motor should draw 265 amperes and scale should indicate 19 ft-lb of torque.

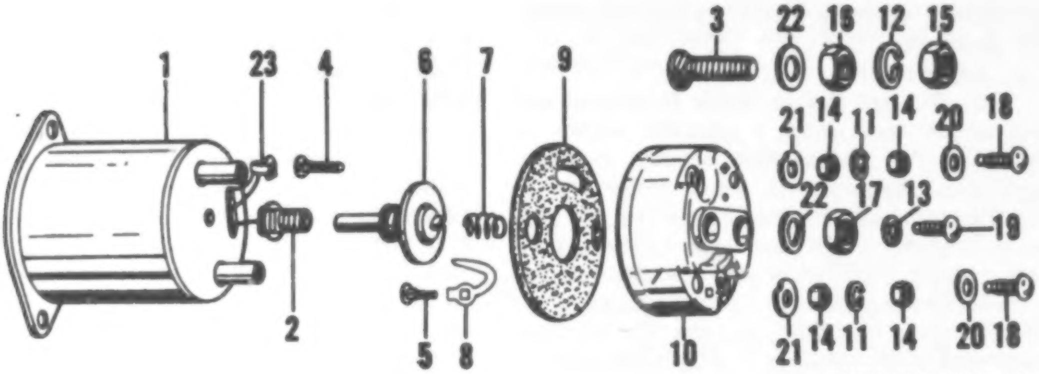
(2) Starter solenoid can be tested for current draw of both windings in parallel and draw of hold in winding alone. Disconnect both leads from main (larger) terminals. Ground terminal normally connected to starter to solenoid case with jumper lead. Connect batteries, variable resistance, and ammeter between solenoid case and smaller terminal. Connect voltmeter between smaller terminal and case. Slowly increase voltage to 12.0 volts. Ammeter should indicate between 27.0 and 30.0 amps. Disconnect jumper lead grounding main solenoid terminal and readjust resistance to obtain 12.0 volts on voltmeter. Ammeter should indicate 4.75 to 5.75 amperes for current draw of hold-in winding.



MEC 3431-215-15/60

1	Frame
2	Brush
3	Brush ground holder
4	Brush insulated holder
5	Brush spring
6	Brush holder support
7	Brush ground lead
8	Field coil
9	Shunt coil
10	Armature
11	Spring
12	Drive assembly
13	Collar
14	Ring
15	Collar
16	Housing
17	Solenoid switch
18	Spring
19	Plunger
20	Shift lever
21	Pin
22	Shift lever stud
23	Lockwasher
24	Lockwasher
25	Lockwasher
26	Lockwasher
27	Lockwasher
28	Nut
29	Nut
30	Screw
31	Screw
32	Screw
33	Screw
34	Screw
35	Screw
36	Washer
37	Bolt
38	Housing
39	Bushing
40	Grommet
41	Insulator
42	Pin
43	Pin
44	Pole shoe

Figure 6–4. Starter, assembly and disassembly (Model LEB 300).



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1	Housing
2	Terminal stud
3	Terminal stud
4	Terminal stud
5	Screw
6	Contact and push rod
7	Spring
8	Contact
9	Insulator
10	Cover
11	Lockwasher
12	Lockwasher
13	Washer
14	Nut
15	Nut
16	Nut
17	Nut
18	Screw
19	Screw
20	Washer
21	Washer
22	Washer
23	Terminal clip

Figure 6-5. Solenoid, assembly and disassembly (Model LEB 300).

1	Nut
2	Lockwasher
3	Nut
4	Screw
5	Lockwasher
6	Spacer
7	Nut
8	Lockwasher
9	Cotter pin
10	Pin
11	Bolt
12	Plunger
13	Cover
14	Screw
15	Lockwasher
16	Screw
17	Lockwasher
18	Nut
19	Lockwasher
20	Washer
21	Insulated washer
22	Stud
23	Nut
24	Lockwasher
25	Washer
26	Insulator
27	Stud
28	Nut
29	Lockwasher
30	Washer
31	Insulated washer
32	Insulated washer
33	Clip
34	Stud
35	Bracket
36	Cup
37	Spring
38	Washer
39	Insulated washer
40	Contact disc
41	Bushing
42	Spring
43	Washer
44	Washer
45	Push rod disk
46	Coil and case
47	Cover
48	Thru bolt
49	Lockwasher
50	Screw
51	Lockwasher
52	Washer
53	Brush
54	Screw
55	Lockwasher
56	Lead
57	Lead
58	Screw
59	Lockwasher
60	Brushholder
61	Brush spring
62	Dowel pin
63	Hinge pin
64	Stop pin
65	Pin
66	Stop pin
67	Plug
68	Bearing
69	Oil cup
70	Wick
71	End bell
72	Armature
73	Bearing
74	Bearing
75	Screw
76	Lockwasher
77	Washer
78	Shift lever
79	Nut
80	Lockwasher
81	Shaft
82	Spring
83	Support
84	Drive assembly
85	Wick
86	Oil cup
87	Bearing
88	Housing
89	Pole shoe
90	Screw
91	Winding
92	Nut
93	Lockwasher
94	Connecting link
95	Nut
96	Lockwasher
97	Washer
98	Insulated washer
99	Insulated washer
100	Insulated washer
101	Insulated washer
102	Screw
103	Winding
104	Winding
105	Screw
106	Lockwasher
107	Dowel pin
108	Center frame

Figure 6-6—Continued.

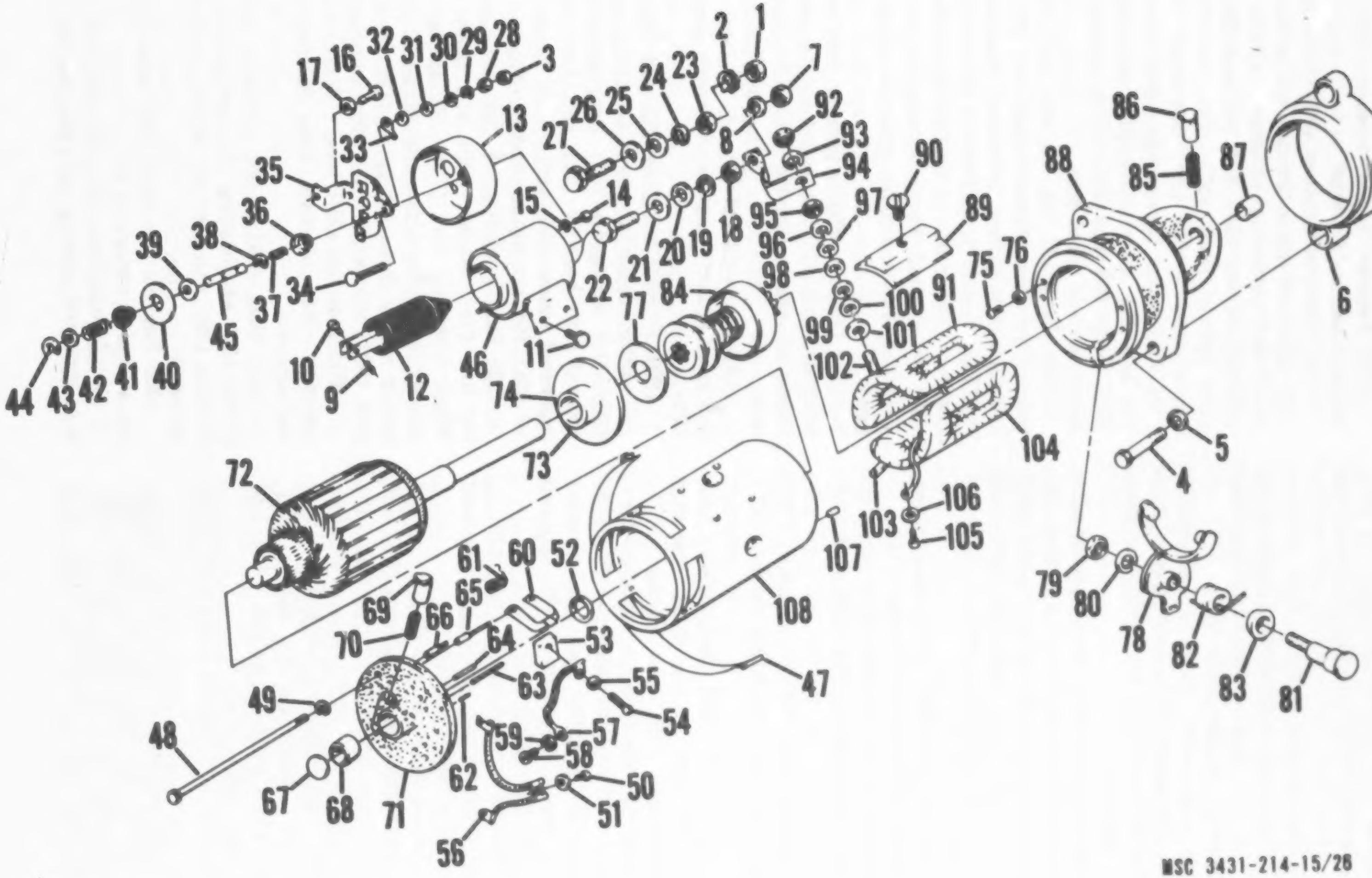
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Figure 6-6. Starter and solenoid, assembly and disassembly (Models LE 300 and LEW 300).

6–5. Starter and Solenoid (Models LE 300 and LEW 30C)

a. Removal and Installation. Refer to paragraph 3–34 to remove and install starter and solenoid.

b. Disassembly (fig. 6–6).

(1) Disconnect lead after removing attaching nut (1) and washer (2) and lead after removing attaching nut (3).

(2) Remove screws (4) and washers (5) and remove solenoid and starter from engine adapter plate with spacer (6). Separate spacer (6) from assembly.

(3) Separate solenoid from starter after removing attaching nut (7) and washer (8) at terminal bracket: cotter pin (9) and shift pin (10) at shift lever; and four bolts (11) attaching switch solenoid to starter. Slide out plunger (12).

(4) Remove cover (13) after removing attaching screw (14) and lockwasher (15).

(5) Remove bracket assembly after removing two attaching screws (16) and lockwashers (17).

(6) Remove nut (18), lockwasher (19), flat washer (20) and insulating washer (21) from stud (22).

(7) Remove nut (23), lockwasher (24), flat washer (25) and insulator (26) from stud (27). Remove stud (27) from bracket.

(8) Remove nut (28), lockwasher (29), flat washers (30) and insulating washer (31) from stud (34). Remove stud from bracket and remove insulating washer (32) and coil lead clip (33) from stud (34).

(9) Remove bracket (35). Stud (22) is soldered to solenoid coil and is not removed from solenoid unless necessary.

(10) Remove push rod assembly from coil and case (46). Separate spring cup (36) and spring (37) from assembly. Press disc (40) against spring (42) and remove retainer washer (38), then separate insulated washer (39), disc (40), bushing (41), spring (42), flat washer (43), retainer washer (44), and push rod disk (45).

(11) Unsnap and remove cover (47) from starter.

(12) Unscrew and remove from starter two thru bolts (48) and lockwashers (49) from commutator end. Remove screw (50) and lockwasher (51) attaching brush lead (56) to winding and pry off and remove commutator end bell.

(13) Remove brake washer (52) from frame assembly on shaft.

(14) Remove brushes (53) from holders (60) after swiveling brushes and holders outward and removing attaching screws (54) and lockwashers (55). Lift out lead (56). Remove ground leads (57) after removing attaching screws (58) and lockwashers (59).

(15) Remove brushholders (60) from pins (63 and 65) after unsnapping springs (61) from pins (64 and 66). Slide springs and brush holders from pins.

(16) Pins (62, 63, 64, 65, and 66) are pressed into commutator end bell (71) and are not normally removed unless necessary.

(17) Plug (67) need not be removed unless bearing (68) required maintenance. Bearing (68) is pressed into commutator end bell (71) and is not normally removed unless damaged.

(18) Oil cup (69) is pressed into commutator end bell (71) and need not be removed unless necessary. Remove wick (70) if necessary.

(19) Pry center frame (108) and drive end housing (88) apart and remove armature (72).

(20) Remove bearings (73 and 74) as a unit after removing two attaching screws (75) and washers (76). Bearing (74) is pressed into bearing (73) and need not be separated unless necessary.

(21) Remove brake washer (77).

(22) Remove shift lever (78) after removing nut (79), washer (80) and shaft (81). While loosening nut (79), lift spring (82) prong from niche in housing (88) and release spring slowly. Separate spring (82) and support (83) from shaft (81) after removal.

(23) Slide out shift lever (78) and drive assembly (84) together from housing (88) and separate.

(24) Wick (85) is not normally replaced oil cup (86) and bearing (87) are pressed into housing (88) and need not be removed unless necessary.

(25) Remove pole shoes (89) after removing attaching screws (90).

(26) If windings (91, 103, and 104) need to be removed, remove nut (92), washer (93),

link (94), nut (95), lockwasher (96), flat washer (97), and insulated washers (98, 99 and 100) from screw (102). Insulated washer (101) comes off after screw (102) is removed. Windings are connected together and removed as a unit after removing screw (105) and washer (106). Screw (102) is drawn through center frame (108) and removed with windings.

(27) Dowel pin (107) is pressed into center frame (108) and is not removed unless replacement is necessary.

c. Cleaning. Clean studs, nuts and metal washers; spacer (6), end bell (71) drive assembly (84), housing (88) and frame (108) in solvent and dry thoroughly. Wipe off solenoid case (46) and plunger (12) with solvent-dampened cloth and dry with clean, lint-free cloth. Clean commutator with No. 00 sandpaper and finish cleaning with vacuum line.

d. Inspection. Inspect brushes (53), brush holders, windings (91, 103 and 104) and armature (72) in similar manner to that outlined for similar parts of engine generator. Inspect surfaces of bearings (68, 74 and 87) for wear and scoring. Inspect drive assembly (84) gears for wear and chipped or broken teeth and spring for general condition. Inspect caps on oil cups (69 and 86) for strong spring action and tight fit. Inspect studs (22, 27, and 34) for burned or otherwise damaged threads. Inspect contact disc (40) for pitted or burned spots.

e. Repair. Replace any parts which do not pass inspection. If drive gear (84) must be replaced, camshaft will probably need replacement also.

f. Reassembly.

(1) Reassemble windings (91, 103, and 104) on pole shoes (89) and install in frame (108) screws (90) and lead screw (105) and washer (106). Place insulated washer (101) on screw (102) before inserting screw through hole in frame (108).

(2) Assemble insulated washers (109, 99, and 98), flat washer (97), lockwasher (96), nut (59), link (94), lockwasher (93), and nut (92) on screw (102). Be sure to assemble parts in order indicated.

(3) Install wick (85), cup (86) and bearing (87) in housing (88) if removed.

(4) Assemble bearing (73) and bearing (74), washer (77) and drive assembly (84) on armature shaft (72).

(5) Hold shift lever (78) in place on drive assembly (84) and slide armature (72) with bearings (73 and 74), washer (77), drive assembly (84), and shift lever into housing (88). Attach assembly with screw (75) and washer (76). Attach shift lever (78) to housing (88) with shaft (81), support (83), spring (82), washer (80), and nut (79). Make sure spring (82) prong fits in slot in housing provided for it before tightening nut (79).

(6) Carefully slide frame (108) over armature (72) into position against housing (88). Make certain dowel pin (107) seats in hole in housing (88).

(7) Install wick (70) and cup (69) in end bell (71) if removed. Press bearing (68) into end bell if removed. Install plug (67).

(8) Press pins (62, 63, 64, 65 and 66) into position if removed from end bell (71).

(9) Install brushholders (60) and springs (61) on pins (63 and 65) and snap springs (61) into place on pins (64 and 66).

(10) Install brushes (53) in holders (60) attaching one end of lead (56) with screws (54) and washers (55). Attach ground lead (57) and other end of lead (56) with attaching screws (58) and lockwashers (59).

(11) Slide brake washer (52) on armature shaft (72).

(12) Slide end bell (71) with assembled brushes over end of armature (72). Swivel brushes and holders outward to enable fitting over armature commutator.

(13) Connect lead (56) (double end) to winding (103) with screw (50) and lockwasher (51).

(14) Install thru bolts (48) together with washers (49).

(15) Assemble retainer washer (38), insulated washer (39), disc (40), bushing (41), spring (42), flat washer (43), and retainer washer (44) on push rod disk (45). Make sure retainer washers (38 and 44) are in grooves on push rod.

(16) Hold plunger end of case down and install push rod assembly. Set spring (37) and cup (36) on disk (45). Place coil lead clip (33) and washer (31) on stud (34) and insert studs (22, 27, and 34) through bracket.

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Attach bracket to case (46) with screw (16) and washer (17).

(17) Assemble insulating washer (31), flat washer (30), lockwasher (29), and nut (28) on stud (34). Assemble insulating washer (26), flat washer (25), lockwasher (24) and nut (23) on stud (27). Assemble insulating washer (21), flat washer (20), lockwasher (19), and nut (18) on stud (22).

(18) Install cover (13) over stud assemblies and attach to bracket (35) with attaching screw (14) and lockwasher (15).

(19) Slide plunger (12) into chamber in coil and case (46). Hold solenoid assembly so plunger does not drop out and set assembly on frame to starter inserting stud (22) through link (94) on starter frame. Attach nut (7) and washer (8) to stud at link; four mounting bolts (11) attaching solenoid to starter frame; and pin (10) and clip (9) attaching plunger (12) to shift lever (78).

(20) Measure brush-spring tension. Correct brush-spring tension is 24 ounces. Install cover (47).

(21) Attach starter motor and solenoid assembly to engine adapter plate with spacer (6) and three attaching screws (4) and lockwashers (5).

(22) After installation of wiring harness, connect lead to stud (34) with attaching nut (3). Connect lead and battery cable to stud (27) with attaching nut (1) and lockwasher (2).

(23) Place three to five drops of oil conforming to Military Specification VV-0-526 in oilers (69 and 86).

g. Adjustments.

(1) Subject starter motor to no-load and lock-torque test using equipment shown in figure 3–19. For no-load test, connect motor in series with battery with which motor will be installed, ammeter capable of reading 500 amperes, and low-resistance, high-wattage, variable resistor. With brake arm disconnected and with 23.5 volts applied to input terminal, motor should rotate at 2,500 rpm and should draw maximum of 35 amperes. For lock test connect brake arm to starter pinion and apply 19.1 volts to input terminal. Motor should draw 265 amperes and scale should indicate 19 lb-ft of torque.

(2) Starter solenoid can be tested for current draw of both windings in parallel and draw of hold-in winding alone. Disconnect both leads from main (larger) terminals. Ground terminal normally connected to starter to solenoid case with jumper lead. Connect batteries, variable resistance, and ammeter between solenoid case and smaller terminal. Connect voltmeter between smaller terminal and case. Slowly increase voltage to 12.0 volts. Ammeter should indicate between 27.0 and 30.0 amps. Disconnect jumper lead grounding main solenoid terminal and readjust resistance to obtain 12.0 volts on voltmeter. Ammeter should indicate 4.75 to 5.75 amperes for current draw of hold-in winding.

6–6. Magneto

a. Removal and Installation. Refer to paragraph 3–33 to remove and install the magneto.

b. Disassembly.

(1) Remove screw (1, fig. 6–7) together with lockwasher (2) and disconnect lead at feed-through capacitor (27).

(2) Remove screw (3) together with washers (4, 5, and 6) and carefully separate magneto from gear cover. If magneto is not being removed in normal order of disassembly, perform step 3 before removing magneto.

(3) If magneto is not being removed in normal order of disassembly loosen screw (5, fig. 6–1) to free top of magneto. Remove cover (7, fig. 6–7) after removing four attaching screws (8) and lockwashers (9). Remove six knobs (10) and disconnect ignition leads at distributor block. Unscrew coupling nuts and disconnect ignition cables at distributor end cap.

(4) Carefully remove gasket (11), spacer (12), and gasket (13) from magneto.

(5) Carefully remove lead gasket (14) from end cap.

(6) Remove end cap assembly after removing four attaching screw and lockwasher assemblies.

(7) Carefully remove lead gasket (15) from housing.

(8) Remove vent cover (16) and screens (18) after removing attaching screws (17) from both sides of end cap (30). Vent on engine side has no cover over screen but attaching screw must be removed before attaching

screw for distributor block assembly can be removed.

(9) Lift out distributor block assembly after removing four attaching screw and lockwasher assemblies.

(10) Remove spring (19) from end of stud (20) then unscrew and carefully remove stud (20) so suppressor (22) and spring (23) do not fall from stud (24).

(11) Unscrew and remove insulator (21). Suppressor assembly consisting of suppressor (22), spring (23), and stud (24) may come out with insulator (21) and can be separated after removal, or suppressor (22) and spring (23) can be removed from distributor block after removal of insulator (21) and stud (24) can be unscrewed and removed separately.

(12) Remove center brush and spring (25) from distributor block (26).

(13) Remove capacitor (27) from end cap (30) together with seal (29) after removing two attaching screw and lockwasher assemblies (28).

(14) Remove rotor and bearing support assembly after removing three attaching screws (31) and lockwashers (32) and screw and lockwasher (33) which will release lead from coil (51) and also spring (34).

(15) Remove wick and holder (35) after removing attaching screw and lockwasher assembly (36) together with flat washer (37).

(16) Remove breaker arm assembly (38), and washer (41). Slide breaker arm wick (42) from end of breaker arm.

(17) Pull rotor (43) from shaft.

(18) Press gear and shaft assembly consisting of gear (45) and shaft (46) from bearing (47) after removing snap ring (44). Shaft (46) may be pressed from gear (45); however, these parts are not normally separated.

(19) Press or drive bearing (47) from support (49) after removing snap ring (48).

(20) Lift bearing (50) (balls and cage) from end of magnetic rotor shaft.

(21) Remove coil (51) after loosening two set screws (52).

(22) Unscrew and remove pin (53).

(23) Bend ears of washer (55) flat and unscrew and remove nut (54) together with washer (55) from rotor shaft to release impulse coupling assembly.

(24) Remove impulse coupling from shaft and separate shell (56), spring (57), hub (58), and spring (59), if necessary. Remove key (60) from shaft.

(25) Slide magnetic rotor assembly from housing and slide drive end bearing (61) (balls and cage) from shaft. If necessary pull bearing inner race from shaft with bearing puller and remove shim (62) and washer.

(26) If necessary, pull inner race of bearing (50) from rotor cam end with bearing puller and remove washer (64) gear (65) and pin (66) from rotor (67).

(27) Punch rotor drive and seal assembly through outer end of housing and separate washer (68), seal (69), and washer (70).

(28) If necessary, remove dowel (71) from housing (72).

c. Cleaning. Wipe outside of magneto housing with solvent-dampened cloth and dry thoroughly. Clean all other parts with vacuum line.

d. Inspection. Inspect bearings (47, 50 and 61). Inspect gaskets (14 and 15) for good condition. Inspect shaft (46) and gears (45 and 65) for scoring and excessive wear. Inspect distributor block (26) for cracks or splits and terminals for damaged threads. Inspect breaker points for pitting and burning. Inspect capacitor (27) for splits, bulges, or other signs of breakdown. Inspect impulse coupling pawls and springs for good condition.

e. Repair. If slightly pitted, clean contact points on points assembly (38) with fine-cut file. Replace any other parts which do not pass inspection.

f. Reassembly. To reassemble magneto assembly, proceed as follows:

(1) Assemble rotor drive end seal assembly consisting of washer (70), seal (69), and washer (68) and install in housing (72). Install dowel (71) in housing (72) if removed during disassembly.

(2) Assemble pin (66), gear (65), and washer (64) on cam end of rotor (67) and press on inner race of bearing (50) if removed during disassembly.

(3) Assemble washer (63) and shim (62) on drive end of rotor shaft and press on inner race of bearing (61) if removed during disassembly.

(4) Slide drive end bearing (61) (balls

and cage) on shaft and install magnetic rotor assembly in housing (72).

(5) Insert key (60) in shaft of rotor (67). Assemble and install impulse coupling consisting of shell (56), spring (57), hub (58), and spring (59) on shaft. Install attaching washer (55) and nut (54) on shaft and bend ears of washer (55) over nut (54).

(6) Screw in pin (53).

(7) Install coil (51) and tighten two set screws (52).

(8) Install bearing (50) (balls and cage) on cam end of magnetic rotor shaft.

(9) Press bearing (47) in support (49) and install snap ring (48).

(10) Press gear (45) on shaft (46) if separated during disassembly. Press gear and shaft assembly into bearing (47) and install snap ring (44).

(11) Install rotor (43) on shaft (46).

(12) Slide breaker arm wick (42) on end of breaker arm (38) and install assembly with attaching washer (41) screw and lockwasher assembly (40) and snap ring (39).

(13) Install wick and holder (35) with attaching flat washer (37) and screw and lockwasher assembly (36). Adjust breaker-point gap.

(14) Install spring (34) and lead from coil (51) on screw and lockwasher (33) and screw assembly into rotor and bearing support assembly, then attach bearing support assembly with three screws (31) and lockwashers (32).

(15) Install seal (29) and capacitor (27) in end cap (30) with two attaching screw and lockwasher assemblies (28).

(16) Install center brush and spring (25) in distributor block (26).

(17) Using thin screwdriver, screw stud (24) into bottom of hole in distributor block. Assemble spring (23), suppressor (22) and insulator (21) and screw assembly onto stud (24).

(18) Screw stud (20) into insulator (21) and slip spring (19) over free end.

(19) Install distributor block assembly with four attaching screw and lockwasher assemblies.

(20) Install vent screens (18) and cover (16) on both sides of end cap (30) with attaching screws (17). Vent on engine side has no cover over screen.

(21) Carefully align lead gasket (15) on housing (72) and install end cap assembly with four attaching screw and lockwasher assemblies.

g. Adjustment. To test magneto and time it to engine, refer to paragraph 3–33.

6–7. Engine Idler Regulator

a. Removal and Disassembly.

(1) Remove nuts (1, fig. 6–8) on two terminal assemblies, tag and disconnect leads from terminals.

(2) Unscrew compression nut (2) and disconnect vacuum line at idler regulator.

(3) Remove clip (3) and pin (4) and disconnect regulator rod (7) at lever (11).

(4) Remove two bolts (5) together with lockwashers (6) while supporting idler regulator assembly, then lift assembly from mounting bracket.

(5) Remove regulator rod (7) after re-

1	Screw	19	Spring	37	Washer	55	Lockwasher
2	Lockwasher	20	Stud	38	Points assembly	56	Shell
3	Screw	21	Insulator	39	Snap ring	57	Spring
4	Lockwasher	22	Suppressor	40	Screw	58	Hub
5	Washer	23	Spring	41	Washer	59	Spring
6	Lockwasher	24	Stud	42	Wick	60	Key
7	Cover	25	Brush	43	Distributor rotor	61	Bearing
8	Screw	26	Insulation block	44	Snap ring	62	Shim
9	Lockwasher	27	Capacitor	45	Distributor gear	63	Gasket
10	Knob	28	Screw	46	Distributor shaft	64	Thrust washer
11	Gasket	29	Washer	47	Distributor bearing	65	Gear
12	Spacer	30	End cap	48	Snap ring	66	Pin
13	Gasket	31	Screw	49	Bearing support	67	Magnetic rotor
14	Gasket	32	Lockwasher	50	Bearing	68	Washer
15	Gasket	33	Screw	51	Coil	69	Seal
16	Shield	34	Spring	52	Set screw	70	Washer
17	Screw	35	Wick	53	Pin	71	Pin
18	Vent wire	36	Screw	54	Nut	72	Housing

Figure 6–7—Continued.

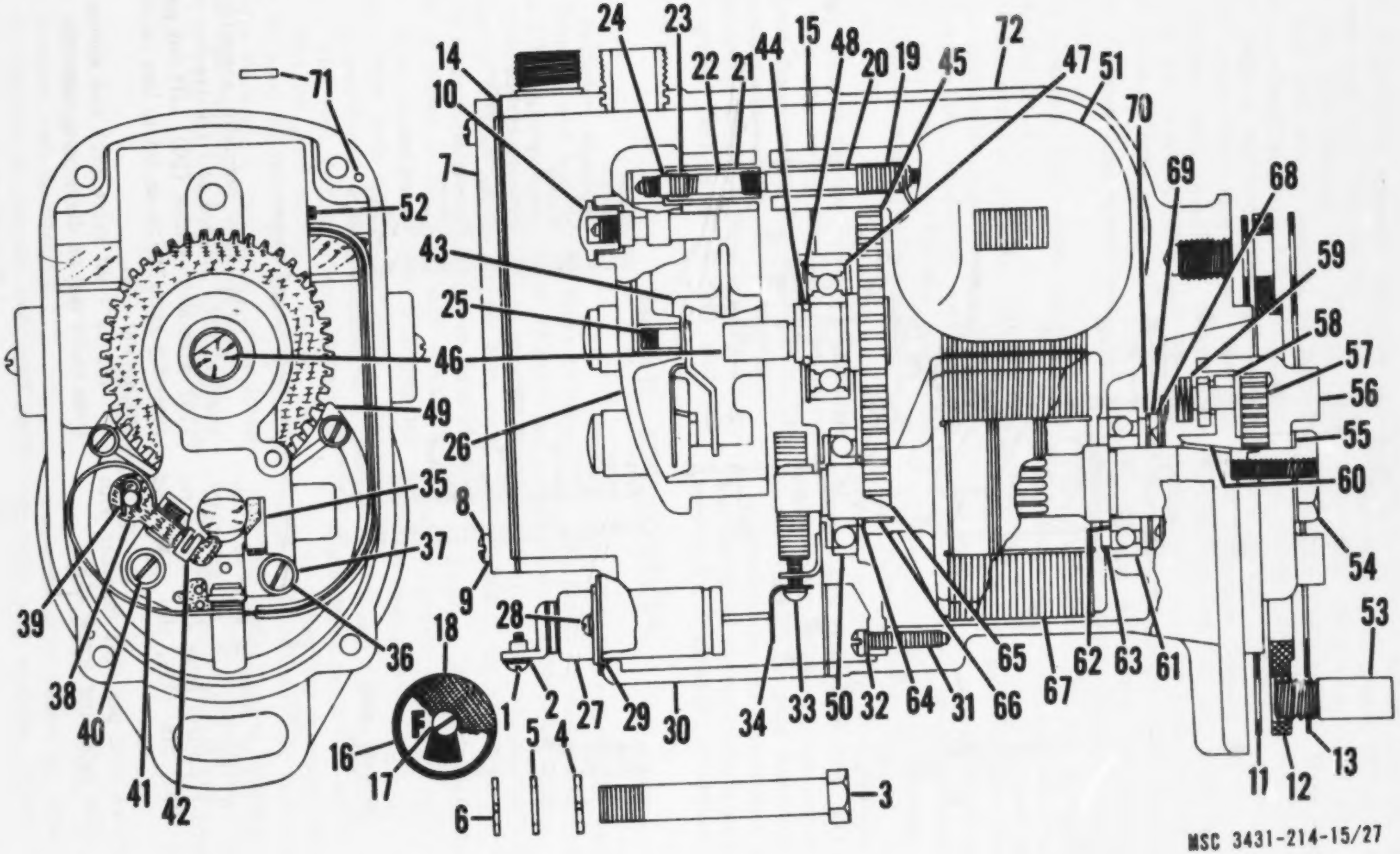
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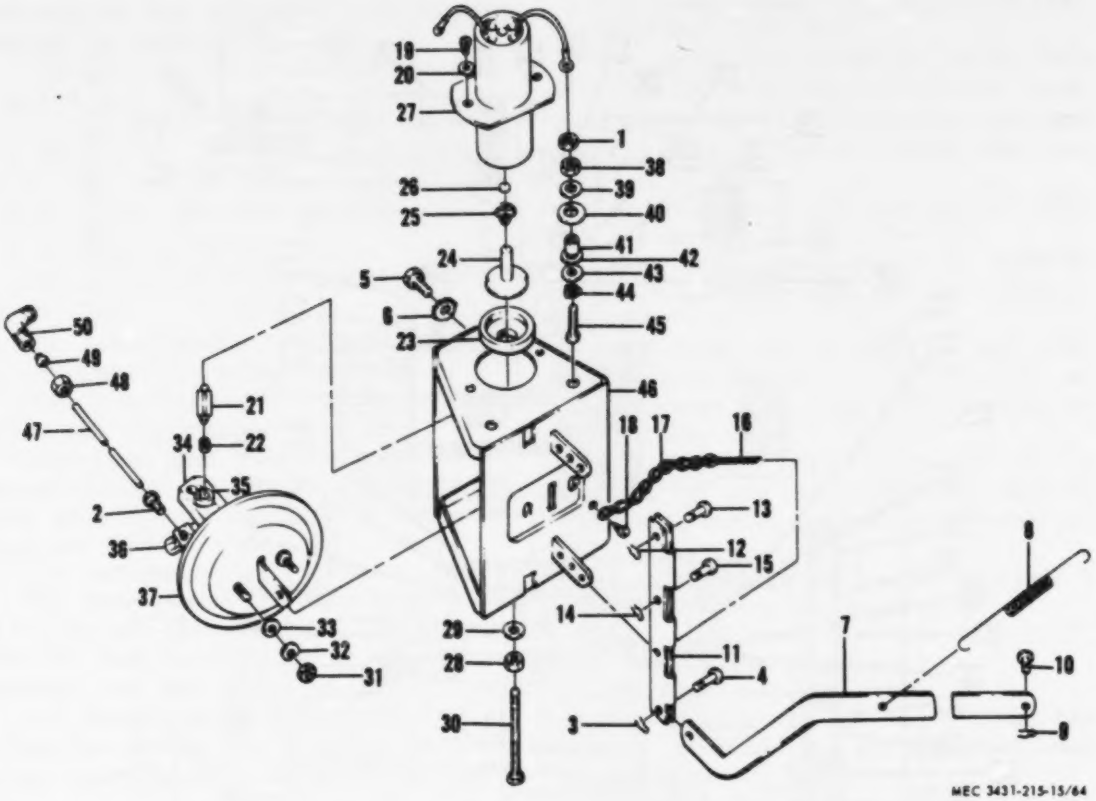
Figure 6–7. Magneto, assembly and disassembly.



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1 Nut
2 Nut
3 Clip
4 Pin
5 Bolt
6 Lockwasher
7 Rod
8 Spring
9 Clip
10 Pin
11 Control lever
12 Clip
13 Pin
14 Clip
15 Pin
16 Latch pin
17 Chain
18 Screw
19 Screw
20 Washer
21 Valve
22 Spring
23 Dust seal
24 Core and cap
25 Spring
26 Spacer
27 Solenoid
28 Nut
29 Washer
30 Bolt
31 Nut
32 Lockwasher
33 Washer
34 Valve seat
35 Spacer
36 Petcock
37 Diaphragm
38 Nut
39 Washer
40 Insulating washer
41 Insulating bushing
42 Insulating washer
43 Washer
44 Lockwasher
45 Screw
46 Case
47 Vacuum line
48 Nut
49 Sleeve
50 Elbow

Figure 6–8. Engine idler regulator, assembly and disassembly.

moving spring (8) at welding generator louvers and clip (9) and pin (10) at carburetor.

(6) Remove control lever (11) after removing clip (12), pin (13), clip (14), and pin (15).

(7) Remove latch pin (16) together with chain (17) after removing screw (18).

(8) Hold idling regulator assembly with solenoid (27) upward and remove two screws (19) with lockwashers (20). Lift out solenoid assembly carefully so as not to lose valve (21) and spring (22).

(9) Lift out valve (21) and spring (22) from valve seat on diaphragm assembly.

(10) Disassemble solenoid removing seal (23), core and cap (24) spring (25), and spacer (26) from solenoid (27). Spacer (26) is very thin and may be removed by tapping seal end of solenoid on clean, flat, level surface.

(11) Remove two nuts (28), flat washer (29) and screw (30), then remove two nuts (31) together with associated lockwashers (32) and flat washers (33) and lift diaphragm assembly from case.

(12) Unscrew and remove seat (34) and spacer (35).

(13) Unscrew and remove petcock (36) from diaphragm (37).

(14) Remove and separate parts of two terminal assemblies consisting of nut (38), flat washer (39), insulating washer (40), bushing (41), insulating washer (42), flat washer (43), lockwasher (44), and screw (45) from case (46).

(15) Remove vacuum line (47) from machine after unscrewing nut (48) from sleeve (49) and disconnecting line at manifold. Unscrew and remove elbow (50) at manifold.

b. Cleaning. Clean all parts except dust cap (23), spacer (26), solenoid (27) and diaphragm (37) in solvent and dry thoroughly. Wipe exterior of solenoid (27) and diaphragm (37) with solvent-dampened cloth and dry with clean, lint-free cloth. Wipe dust cap (23) and spacer (26) with clean, lint-free cloth. Blow out line (47) with compressed air.

c. Inspection. Inspect rod (7) for dents or cracks and line (47) for kinks or breaks. Inspect lever (11) for wear at pivot holes. Hold thumb and forefinger lightly over air holes in diaphragm and work mechanism by hand. Diaphragm should exhaust air when pushed in. Inspect dust seal (23) for good condition and hardening or lack of resilience. Check for open solenoid coil by checking between lugs of leads on solenoid (27) with ohmmeter. Inspect valve (21) and seat for scoring and wear. If valve or seat are scored, replace both parts.

d. Repair. Remove any undesired kinks and bends from rod (7) but do not deform from designed shape as fit at carburetor is critical. Remove any kinks from line (47) but do not deform from designed shape. Replace any other parts which do not pass inspection.

e. Reassembly and Installation. To reassemble and install engine idler regulator assembly, reverse the disassembly procedure.

Section III. COOLING SYSTEM

6–8. Radiator

a. Removal and Installation. Refer to paragraph 3–39 to remove and install radiator.

b. Cleaning. Remove debris from exterior of radiator. If radiator core is clogged with rust, dirt, or other foreign matter, reverse flush radiator as shown in fig. 3–25 until stream is clear. Blow out radiator core, directing air pressure from both sides of radiator.

c. Test and Repair. Inspect radiator for core clogged with rust, dirt, or debris. Inspect cap and gasket for good condition. Inspect drain cock for good condition and proper operation of valve mechanism. Check for broken solder joints. Test radiator for leaks as follows:

(1) Plug overflow pipe then tighten cap in place.

(2) Plug top outlet with waste material.

(3) Insert air hose in bottom outlet and calk securely with cotton waste.

(4) Immerse radiator in water and apply five pounds of air pressure.

***Caution:* Do not use air pressure greater than five pounds per square inch or damage to radiator may result.**

(5) Watch for air bubbles and note point of origin. Mark point with chalk.

(6) Solder leak carefully. Do not use more solder than necessary. Do not permit solder to flow into radiator core passages.

(7) If leaks are numerous or weak or corroded spots exist, replace radiator.

Section IV. ENGINE

6–9. Oil Pump

a. Removal and Disassembly.

(1) Remove oil pan and associated parts as outlined in paragraph 6–12.

(2) Remove oil pump assembly from crankcase after removing attaching nut (1, fig. 6–9) and washers (2 and 3) from stud (4).

(3) Remove sleeve (5) and gear (6) after driving out pin (7).

(4) Remove screen (8).

(5) Remove frame (9) after removing two attaching screw and lockwasher assemblies (10) and spacer (11). Carefully lift off gasket (12).

(6) Remove cover (13) after removing four attaching screw and lockwasher assemblies (14). Carefully lift off gasket (15).

(7) Remove gear (16) and shaft (19) as an assembly then separate gear (16) from shaft (19) after removing snap ring (17). Remove Woodruff key (18).

(8) Remove gear (20) and shaft (21) and separate gear from shaft.

(9) Press bushing (22) from body (23).

b. Cleaning. Clean all parts except gaskets (12 and 15) in solvent and dry with compressed air. Clean gears (6, 16 and 20) with wire brush and blow off with compressed air.

c. Inspection. Inspect drive gear (6) for wear or scoring, inspecting mating gear on camshaft at same time. If scored or badly worn, both pump and drive gear and camshaft must be replaced. Examine gears (16 and 20) and pump body (23) for signs of wear indicating lack of clearance. Inspect cover (13) and face of gears for wear or scoring. Replace worn or scored gears or cover. If body shows wear, replace pump. Inspect shaft (19) and bushing (22) for excessive wear. Inspect gaskets (12 and 15) for good condition.

d. Repair. Replace any parts which do not pass inspection. If drive gear (6) must be replaced, camshaft will probably need replacement also.

e. Reassembly and Installation. To reassemble and install oil pump assembly, proceed as follows:

(1) Press bushing (22) into body (23).

(2) Slide gear (20) on shaft (21) and install shaft and gear assembly in body (23).

(3) Insert Woodruff key (18) in shaft (19) and slide gear (16) on shaft. Secure gear with snap ring (17).

(4) Check gear clearance in body as shown in fig. 6–10. Clearance should not be less than minimum limit given in table 5–1 and gears must not contact walls when rotated.

(5) Install gasket (15, fig. 6–9) on body (23) and check end clearance of gear and shaft assembly with straight edge and feeler guage. Clearance shall not be less than minimum limit given in table 5–1.

(6) Install cover (13, fig. 6–9) with four attaching screw and lockwasher assemblies (14).

(7) Install gasket (12), frame (9) and spacer (11) with two attaching screw and lockwasher assemblies (10).

(8) Install screen (8) on frame (9).

(9) Install gear (6) with attaching pin (7) on shaft (19). When replacing gear (6) it is necessary to line up hole in gear with hole in shaft and drill through other half of gear before pinning in place.

(10) Press sleeve (5) on shaft.

(11) Install oil pump assembly on stud (4) on front intermediate bearing cap with attaching washers (3 and 2) and nut (1). Be sure 1/8-inch washer (3) is between oil pump and main bearing cap. Failure to replace washer (3) will cause interference between oil pump and camshaft.

6–10. Crankshaft, Flywheel, and Piston Assembly

a. Removal and Disassembly. To remove and disassemble crankshaft, flywheel, and piston assembly, proceed as follows:

(1) Hold flywheel stationary with bar held between flywheel bolts (13, fig. 6–11), unscrew and remove starting jaw (1). Slide off washer (2).

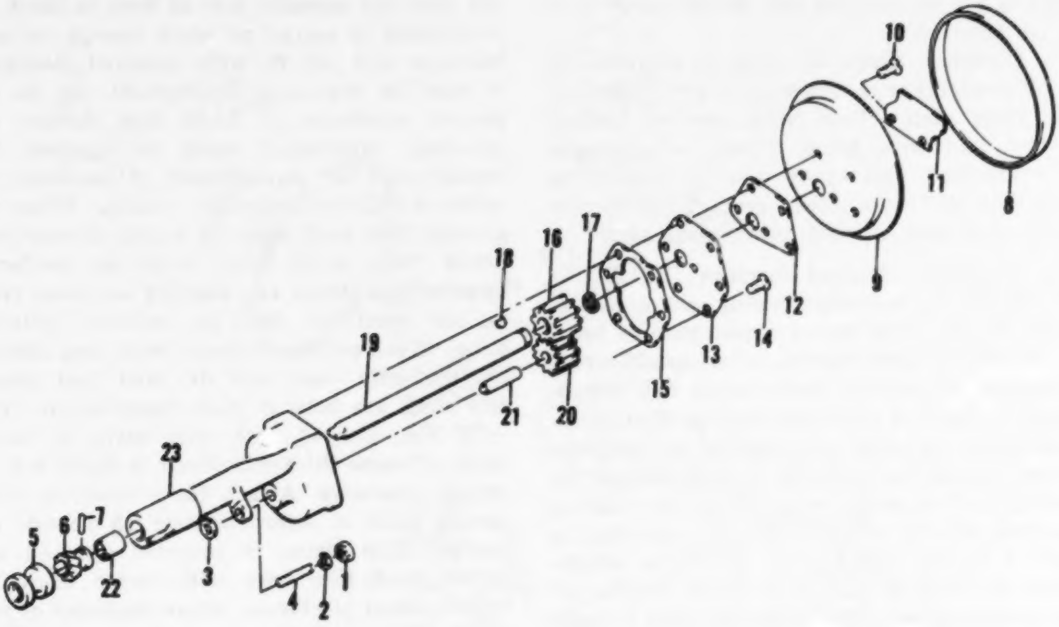
(2) Pull off pulley (3) with suitable gear puller, remove keyway plug (4) from keyway of pulley, and Woodruff key (5) from crankshaft.

(3) Remove gear cover as outlined in paragraph 6–12, then slide off oil thrower (6).

(4) Pull off gear (7) with suitable gear puller, then remove Woodruff key (8) and thrust plate (9) from crankshaft.

(5) Remove flywheel and ring gear (10) after removing six attaching nuts (11), lockwashers (12) and bolts (13). Balance plugs (14) and studs (15) may be removed if necessary.

(6) Remove cylinder head and oil pan as outlined in paragraph 6–12.



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1	Nut	9	Frame	17	Snap ring
2	Lockwasher	10	Screw	18	Woodruff key
3	Washer	11	Spacer	19	Shaft
4	Stud	12	Gasket	20	Idler gear
5	Sleeve	13	Cover	21	Shaft
6	Driven gear	14	Screw	22	Bushing
7	Pin	15	Gasket	23	Body
8	Screen	16	Driven gear		

Figure 6-9. Oil pump, assembly and disassembly.

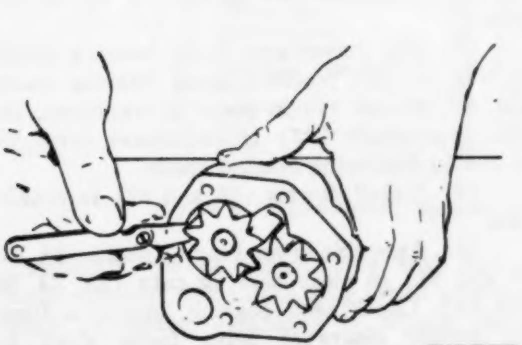

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Figure 6-10. Checking oil pump gear.

(7) Remove twelve attaching cotter pins (16) nuts (17) and bolts (18) from connecting rod (21) caps. Lift out caps and lower bearing shells (22), then wrap connecting rods with rags so as not to damage cylinder walls and push connecting rods and pistons through tops of cylinders. Lift out top bearing shells (22).

(8) Remove twelve retaining rings (19) and six piston pins (20) and separate connecting rods from pistons. Bushing (23) may be pressed out if worn or damaged.

(9) Using a ring spreader, carefully remove four rings (24, 25 and 26) from piston (27). Spread rings only enough to remove from piston.

(10) Remove four main bearing caps (28, 29, 30 and 31) after removing lock wires (32), screws (33 and 34), and washers (35).

(11) Remove dowels (36 and 37) and lift out lower bearing shells (38, 39, 40 and 41).

(12) Remove crankshaft (43) from crankcase with bushing (42), then lift out upper bearing shells (38, 39, 40 and 41). Bushing

(42) is a pilot bushing and should never need to be removed.

b. Cleaning. Clean all parts in solvent and dry thoroughly with compressed air. Clean carbon from piston head with scraper, carbon solvent and wire brush. Clean oil passages in crankshaft and spurt hole in connecting rods with stiff wire. Clean gear (7) with wire brush and blow off with compressed air.

c. Inspection. Inspect bearings (22, 38, 39, 40 and 41) for corrosion pitting, and excessive wear. Figure 6–12 shows appearance of bearing surface of good bearing after use. Measure thickness of bearing shells using ball micrometer. If bearing shells are thinner than minimum given in table 5–1, replace all bearings. Inspect crankshaft (43, fig. 6–11) journals for scoring and excessive wear. Minimum bearing journals should be within limits specified in table 5–1, and crank pins should be within limits specified in table 5–1. Check crankshaft for straightness within limits specified in table 5–1. Inspect connecting rod (21, fig. 6–11) bearing surfaces for scoring or excessive wear. Piston pin bushing should be smooth and within limits specified in table 5–1. Bushing hole should be within limits specified in table 5–1. Check connecting rods with piston pin assembled for twist and squareness on fixture as shown in figures 6–13 and 6–14. Connecting rod must be within limits specified in table 5–1 as checked over distance of four inches. Bend or twist connecting rod to meet specifications. Check pistons (27, fig. 6–11) for excessive ring groove wear and for piston pin hole diameter. Inspect head of piston for pitting and entire body for cracks. Check piston rings for excessive wear. Check piston pins for excessive wear or scoring (table 5–1). Inspect crankshaft gear (7, fig. 6–11) and ring gear (10) for excessive wear and broken or chipped teeth. Inspect bearing caps (28, 29, 30 and 31) for scoring and excessive wear. Check pulley (3) for wear and warping.

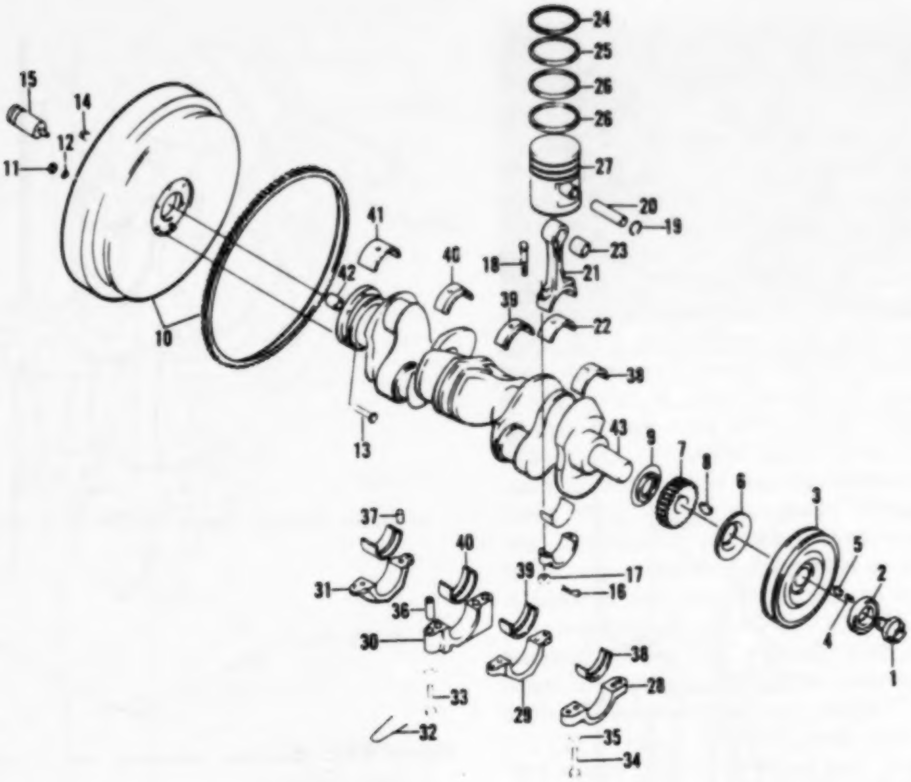
d. Repair. Replace bearing (22, 38, 40 and 41) which do not pass inspection. If crankshaft is not removed from engine, upper bearing shells can be removed with pin with angular head as shown in fig. 6–15. Insert pin in crankshaft oil hole and turn crankshaft in clockwise direction. Head of pin will force upper shell out opposite side of bore in block. If crankshaft is scored or worn enough so new bearings will not fit with required clearance it must be reground. Crankshaft can be reground maximum of 0.040 inch. Before regrinding, crankshaft must be checked for straightness and straightened, if necessary, to within 0.002-inch indicator reading. When reground, fillet radii must be within dimensional limits (fig. 6–16) and must be perfectly blended into thrust and bearing surfaces. New pistons must be fitted in rebored cylinder bores. Make certain cylinder walls and pistons are perfectly clean and dry and that piston and block are both at room temperature (68° –70° F.). Use ½ inch wide strip of feeler stock of same thickness given in table 5–1, as proper clearance. Attach feeler stock to small spring scale of approximately 15 pounds capacity. Slide piston in inverted position and feeler stock into bore with feeler stock between piston pin bosses where diameter of piston is greatest. Push piston approximately two inches down in cylinder bore. If piston fit is correct, feeler stock can be withdrawn with pull of 5 to 10 pounds indicated on scale. After individual pistons are fitted, mark number of cylinder with chalk on head to enable proper reassembly. Replace any other parts which do not pass inspection.

e. Reassembly and Installation. To reassemble and install crankshaft, flywheel, and piston assembly, turn cylinder and crankcase assembly with crankcase side up, and proceed as follows:

(1) Dip upper and lower bearing shells in lube oil and position upper bearing shells (38, 39, 40 and 41) in place in crankcase. Install crankshaft (43) in crankcase carefully to avaoid displacing bearing shells.

(2) Install dowels (36 and 37) in crankcase.

(3) Assemble lower bearing shells (38, 39, 40 and 41) in main bearing caps (28, 29, 30 and 31). Check each bearing, one at a time, for proper clearance using feeler stock as shown in fig. 6–17. Use piece of ½-inch feeler stock of thickness equal to maximum allowable clearance lengthwise in bearing shell on film of oil. Assemble bearing caps and tighten screws to specified torque. Try to turn crankshaft by hand (with minimum clearances,



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1	Starting jaw
2	Washer
3	Pulley
4	Plug
5	Woodruff key
6	Oil thrower
7	Timing gear
8	Woodruff key
9	Thrust plate
10	Flywheel assembly
11	Nut
12	Lockwasher
13	Bolt
14	Plug
15	Stud
16	Cotter pin
17	Nut
18	Bolt
19	Retaining ring
20	Piston pin
21	Rod and cap
22	Bearing
23	Bushing
24	Piston ring
25	Piston ring
26	Piston ring
27	Piston
28	Bearing cap
29	Bearing cap
30	Bearing cap
31	Bearing cap
32	Lock wire
33	Screw
34	Screw
35	Washer
36	Ring dowel
37	Dowel
38	Main bearing
39	Main bearing
40	Main bearing
41	Main bearing
42	Bushing
43	Crankshaft

Figure 6–11. Crankshaft, flywheel, and piston assembly, assembly and disassembly.

crankshaft can be turned only with bar or large wrench). If definite drag is felt or crankshaft is locked, clearance is within limits. After checking each bearing clearance, remove piece of feeler stock. Reinstall bearing caps with attaching screws (33 and 34, fig. 6–11) and washers (35). Tighten screws to specified torque. Insert lock wire (32) through holes in heads of attaching screws and twist tight over bearing cap. If crankshaft is scored or worn so that new bearing will not fit within required clearance, crankshaft must be reground.

(4) Press new bushing (23) into connecting rod (21) with arbor press (fig. 6–18) if old bushing was removed during disassembly. Hone bushing to new limits given in Table 5–1. If there is excess of stock in piston pin bushing, ream first then hone.

(5) Heat pistons (27, fig. 6–11) in oven

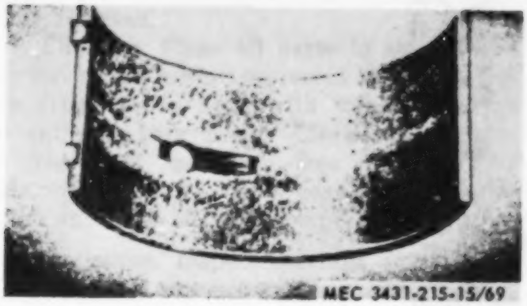
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Figure 6-12. Appearance of good bearing after wear.

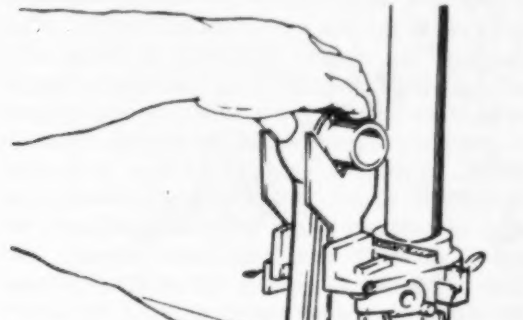
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Figure 6-13. Checking connecting rod for twist.

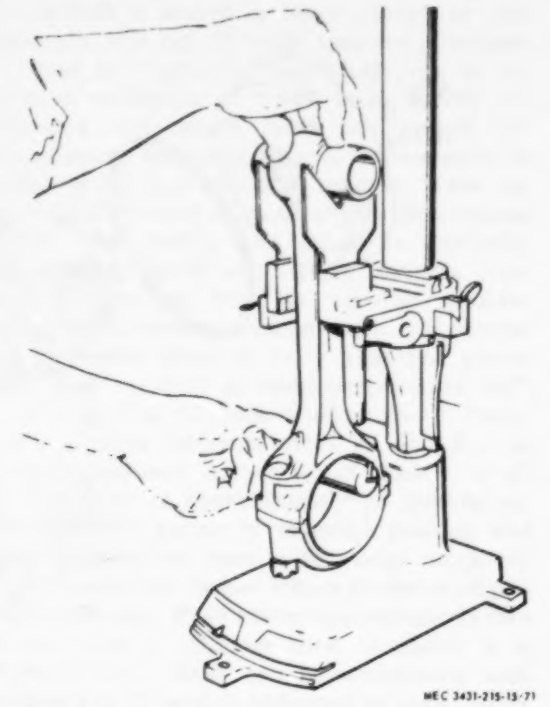
MEC 3431-215-15/71

Figure 6-14. Checking connecting rod for alignment.

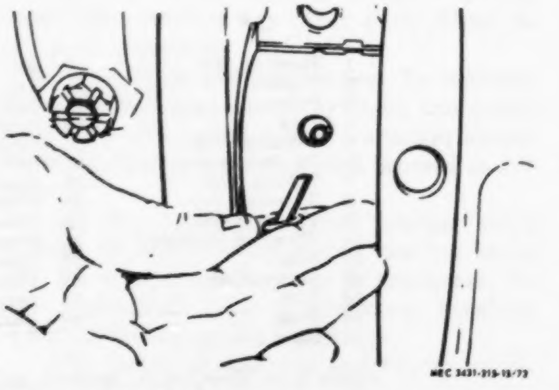
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Figure 6-15. Removing upper main bearing shells, crankshaft not removed.

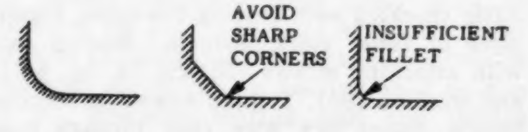

AVOID
SHARP
CORNERS
INSUFFICIENT
FILLET
RIGHT
WRONG
WRONG
MEC 3431-215-15/73

Figure 6-16. Crankshaft fillet radii.

or hot water to minimum temperature of 160° F. to enable easier installation of piston pins. Insert connecting rod (21) in piston (27) and align bushings (23) with holes in piston. Push piston pin (20) through piston and tap through connecting rod and into place with hammer. Assemble snap rings (19) making certain each is fully seated. Check connecting rod and piston assembly for alignment as shown in fig. 6-19.

(6) Before installing piston rings (24, 25 and 26, fig. 6-11) on pistons (27), check rings in cylinders for correct gap. Insert piston and rod assembly upside down in cylinder bore and

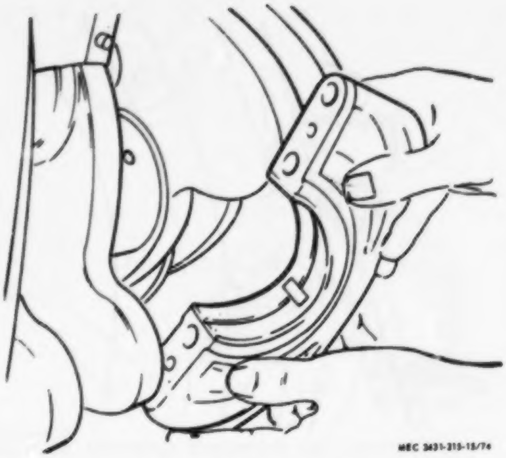


Figure 6-17. Checking main bearing clearance.

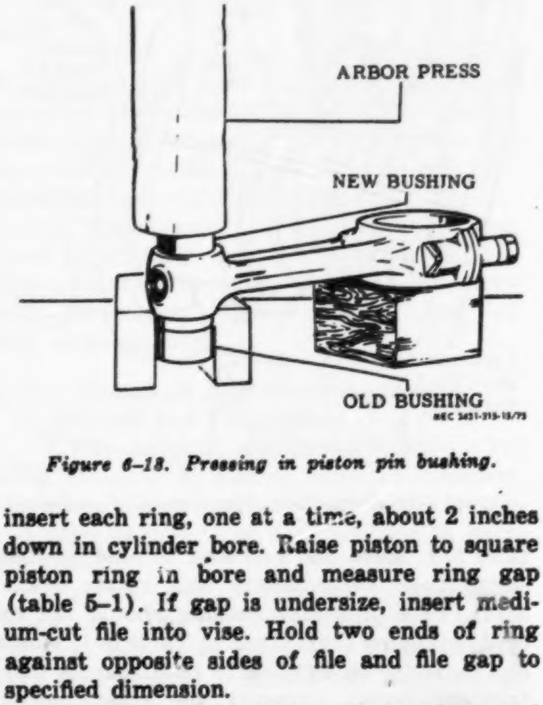


Figure 6-18. Pressing in piston pin bushing.

insert each ring, one at a time, about 2 inches down in cylinder bore. Raise piston to square piston ring in bore and measure ring gap (table 5-1). If gap is undersize, insert medium-cut file into vise. Hold two ends of ring against opposite sides of file and file gap to specified dimension.

(7) Wrap connecting rod in cloth and place in vise to facilitate piston ring installation.

(8) Check ring grooves in piston (27, fig. 6-11) for burrs or other interference by rolling each ring in its groove.

(9) Install rings (24, 25 and 26) on piston (27) using ring expander tool. Start with bottom ring and work upward on piston. Check each ring side of groove at various positions (table 5-1). Stagger gaps of rings around piston.

(10) Oil cylinder bores liberally with lube oil. Wrap lower part of connecting rod with clean, lint-free cloth to protect cylinder walls. Insert piston and rod assemblies in cylinder bores using ring compressor. Use hammer handle or similar tool to tap piston assemblies out of ring compressor into cylinder bore. Remove cloth from connecting rods and carefully attach upper and lower bearing shells (22 fig. 6-11), after dipping in lube oil secure loosely to connecting rods (21), with attaching bolts (18), nuts (17), and cotter pins (15). Check each connecting rod bearing clearance by using piece of ½ inch feeler stock. Instead of turning crankshaft to check clearance, try to move connecting rod from side to side. If new clearances are present, it will be necessary to tap connecting rod from side to side with hammer. If rod moves freely with feeler stock equal to maximum allowable clearance given in table 5-1 replace bearing shells.

(11) Install balance plugs (14, fig. 6-11) and studs (15) in flywheel and ring gear (10) if removed.

(12) Attach flywheel and ring gear (10) on crankshaft (43) with six attaching bolts (13), lockwashers (12) and nuts (11).

(13) Install thrust plate (9) and Woodruff key (8) on crankshaft (43).

(14) Start gear (7) on crankshaft. Turn crankshaft until punch-marked tooth lines up between two punch-marked teeth on camshaft gear. Drive crankshaft gear on shaft with suitable driver on mildsteel pipe.

(15) Check camshaft end play.

(16) Slide oil thrower (6) on crankshaft.

(17) Check crankshaft end play as follows: Slip pulley (3) and washer (2) on crankshaft. Tighten starting jaw (1) in place. Force crankshaft to extreme forward position with screwdriver under crankshaft gear. Attach dial indicator to indicate flywheel movement as illustrated in figure 6-20. Force crankshaft to extreme rear position Dial reading should not exceed the new limits given in table 5-1. If limits are exceeded, remove crankshaft gear and thrust plate and install shims between front-end of main bearing journal and thrust plate

(9, fig. 6–11) as shown in fig. 6–21. Replace thrust plate (9, fig. 6–11) gear (7), oil thrower (6), washer (2) and starting jaw (1) and recheck end clearance. If clearance is within limits, remove starting jaw (1) and washer (2).

(18) Check clearance between crankshaft and camshaft gears as follows. Using a screw driver, pry teeth on gears as far apart as possible. Check clearance with feeler gauge as shown in figure 6–22. Clearance shall not exceed maximum limit given in Table 5–1. If maximum clearance is exceeded, replace both camshaft gear and crankshaft gear as the two timing gears are matched pairs.

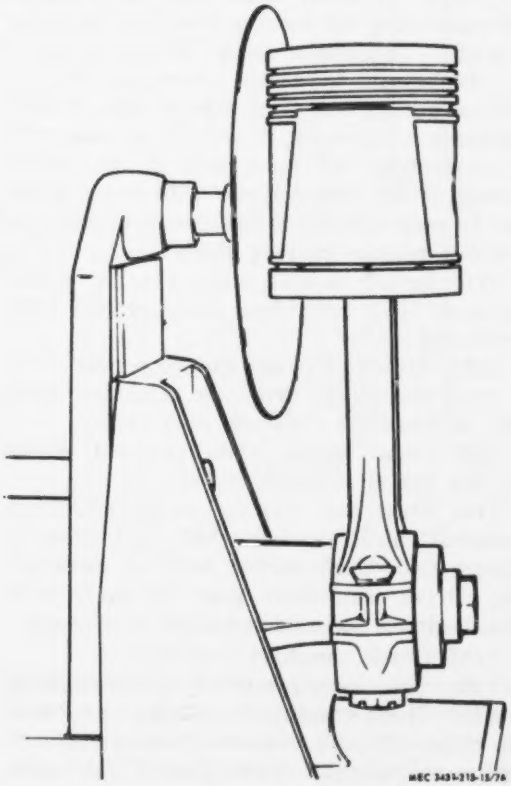


Figure 6–19. Checking alignment of piston.

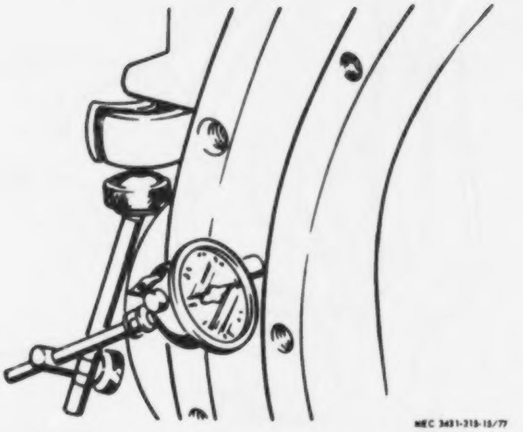


Figure 6–20. Checking crankshaft end play.

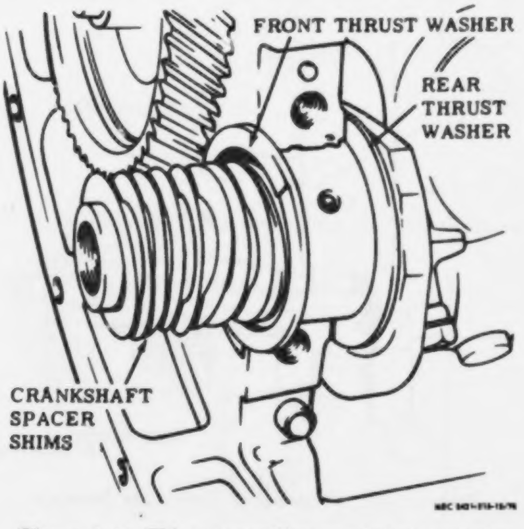


Figure 6–21. Shims controlling crankshaft end play.

(19) Check flywheel face and bore and adaptor plate face and bore for squareness and concentricity. Mount dial indicator on adaptor plate to read flywheel face hand against crankshaft gear on flywheel to eliminate end play. Total indicator reading should not exceed maximum limit given in table 5–1. Move dial indicator to read flywheel counterbore concentricity and rotate crankshaft. Total indicator reading should not exceed maximum limit given in Table 5–1. Mount dial indicator on flywheel to read adaptor plate face squareness (runout) and rotate crankshaft. Hold hand against crankshaft gear or flywheel to eliminate end play. Total indicator reading should not exceed maximum limit given in table 5–1. Move dial indicator to read adaptor plate counterbore concentricity and rotate crankshaft. Total indicator reading should not exceed maximum limit given in table 5–1.

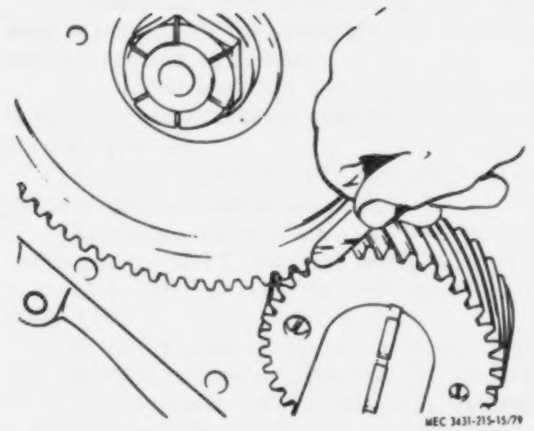


Figure 6-22. Checking crankshaft and camshaft gear spacing.

(20) Install oil pump as outlined in paragraph 6-9.

(21) After replacing gear cover, insert Woodruff key (5, fig. 6-11) in crankshaft and tap pulley (3) on crankshaft with soft hammer. Insert keyway plug (4) in keyway and tap into position with hammer. Face of plug (4) should be flush with face of pulley (3).

(22) Slide washer (2) on crankshaft, then screw on starting jaw (1) after placing bar between bolts (13) on flywheel to hold crankshaft stationary. Tighten starting jaw (1) with large wrench.

6-11. Camshaft and Valve Assembly

a. Removal and Disassembly.

(1) If camshaft and valve assembly is not being removed in normal order of disassembly, remove gear cover, cylinder head, oil pan and valve chamber cover as outlined in paragraph 6-12.

(2) Compress valve springs with a valve spring lifter and remove two locks (1, fig. 6-23) from each valve stem, when in closed position, then remove retainers (2) and springs (3) through valve tappet chamber and valves (4) from top of cylinder and crankcase assembly. Remove all valves and place in order, and tag so that both intake and exhaust valve do not become mixed in handling.

(3) Lift out and separate cap (5), screw (6) and tappet (7).

(4) Remove inserts (8) and guides (9) only if in need of replacement

(5) Bend ear of locknut (12), flat against gear, unscrew and remove nut (11) while holding gear (10) stationary. Slide off nut (12) and pull off gear (10). Remove Woodruff key (13) from keyway on shaft.

(6) Remove thrust plate (14) after removing two attaching screw and lockwasher assemblies (15).

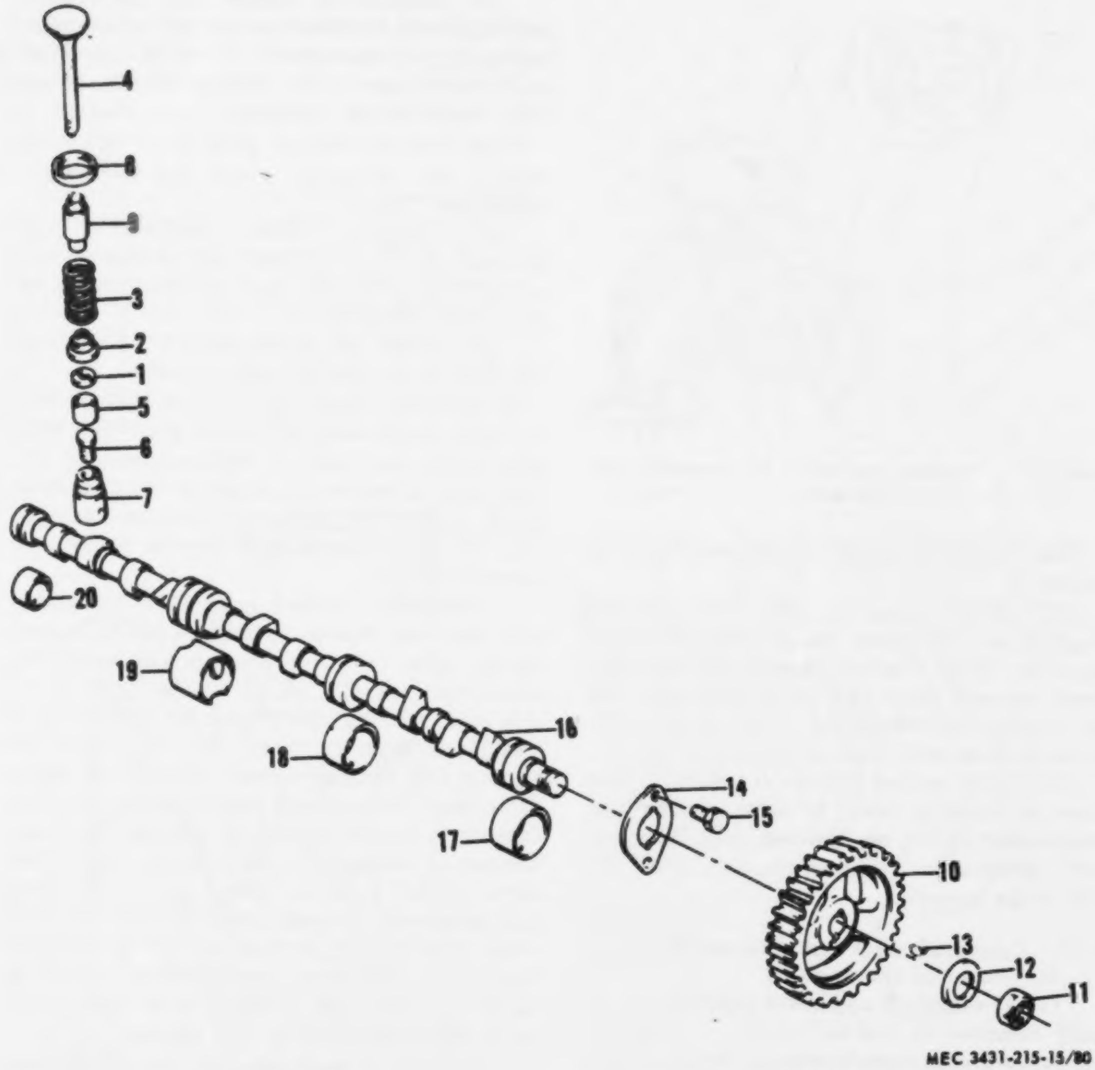
(7) Carefully slide camshaft (16) through front of cylinder and crankcase assembly being careful not to scuff cams or journals or bushings.

(8) Drive out bushings (17, 18, 19 and 20) only if in need of replacement.

b. Cleaning. Clean all parts in solvent and dry with compressed air. Clean gear (10) with wire brush and blow off with compressed air. Use wire, if necessary, to clean deposits from inside guides (9). Clean oil holes in bushings (17, 18, 19 and 20) with bristle brush and compressed air.

c. Inspection. Inspect gear (10) for excessive wear and broken or chipped teeth. Inspect thrust plate (14) for scoring and wear. Inspect bushings (17, 18, 19 and 20) for excessive wear, scoring, and proper ID. Inspect cams and journals on camshaft (16, fig. 6-23) for scoring and excessive wear. Inspect oil pump drive gear on camshaft for wear and scoring. Inspect valves for pitted or burned faces and warped or excessively worn stems. Inspect inserts (8, fig. 6-23 for pitted or burned seats and looseness. Inspect valve guides (9) for wear. Check valve springs on spring tester to make sure minimum specifications listed in table 5-1 are met. Inspect each tappet (7, fig. 6-23) face carefully for pitting.

d. Repair. If bushings (17, 18, 19 and 20) are scored or worn beyond allowable limits, drive out and carefully drive in new bushings. Be careful to line up oil holes in bushings with oil holes in block. If camshaft (16) is scored or worn excessively or has worn or scored oil pump drive gear, replace. Valves must be refaced or replaced. All valves having less than 50% margin thickness (outer edge of valve head) after refacing (fig. 6-24) must be replaced. Compare refaced valve with new valve to check margin thickness. Check all refaced or new valves in 5 blocks with indicator (fig. 6-25) to determine if contact face is true with stem within 0.002 inch. If not, repeat refacing



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1	Retainer lock
2	Retainer
3	Valve spring
4	Valve
5	Cap
6	Tappet screw
7	Tappet
8	Insert
9	Valve guide
10	Camshaft gear
11	Nut
12	Nut
13	Woodruff key
14	Thrust plate
15	Screw
16	Camshaft
17	Bushing
18	Bushing
19	Bushing
20	Bushing

Figure 6-23. Camshaft and valve, assembly and disassembly.

operation. If exhaust valve inserts require replacing, use puller for removal as shown in figure 6-26. Counterbore for 0.010 larger insert. Install new insert during reassembly. When necessary drive all valve guides out from combustion chamber side with driver slightly smaller than OD of valve guide. Drive new guides into place using suitable driver from combustion side during reassembly. Replace any other parts which do not pass inspection.

e. Reassembly and Installation. To reassemble and install the camshaft and valve assembly, proceed as follows:

(1) Install bushings (17, 18, 19 and 20) in cylinder and crankcase assembly if removed during assembly.

(2) Slide camshaft (16) through front of cylinder and crankcase assembly.

(3) Install thrust plate (14) with two attaching screw and lockwasher assemblies (15).

(4) Insert key (13) in keyway on camshaft (16).

(5) Drive gear (10) on camshaft with soft mallet or mild-steel pipe of proper diameter. Brace camshaft with suitable bar through fuel pump opening in block to avoid knocking expansion plug in rear of cylinder block out of position.

(6) Install nuts (12 and 11) on shaft. Bend ear of lock nut (12) over nut (11) with chisel and hammer.

(7) Install exhaust inserts (8) in cylinder block if removed during disassembly. Chill insert in dry ice or refrigerator for 20 minutes before assembling. Install insert in counterbore using piloted driver as shown in figure 6–27. Tap in place with very light hammer blows. Seat insert firmly on bottom of counterbore then peen into place. After seating inserts, grind intake and exhaust valve seats as shown in figure 6–28. Grind intake valve seat to 30° angle and exhaust valve to 45° angle. Use pilot having solid stem with long taper so valve seats will be ground concentric and square. Before removing arbor, indicate seat as shown in fig. 6–24. Total indicator reading of runout must not exceed 0.002 inches.

(8) Install guides (9, fig. 6–23) in cylinder block if removed during disassembly. Using suitable driver. drive guides into block from top of block to correct depth below valve seat (fig. 6–30 and table 5–1). Ream new valve guides to new size given in table 5–1.

(9) Coat valve seat lightly with Prussian blue and drop valve into position. Rotate valve slightly to transfer blue pattern to valve face. Contact pattern should have width of 1/16 inch to 3/32 inch and must fall well within width of valve face, leaving at least 1/64 inch on either side. If contact is over 3/32 inch wide, seat in valve head may be narrowed by using 15° stone to reduce outside diameter or 60° or 75° stone to increase inside diameter (fig. 6–31). After narrowed-down seat is brought within limits, seat should be retouched lightly with original stone to remove burrs or feathered edge. Valves should seat in block as shown in fig. 6–32.

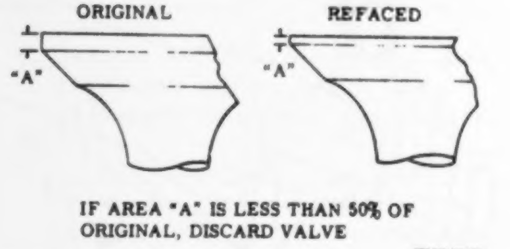


Figure 6–24. Allowable head thickness of refaced valves.

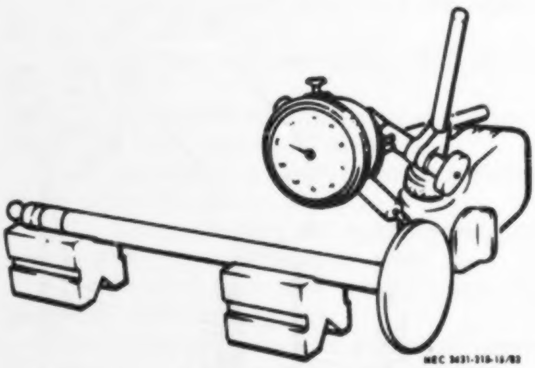


Figure 6–25. Checking valve facing in V-block.

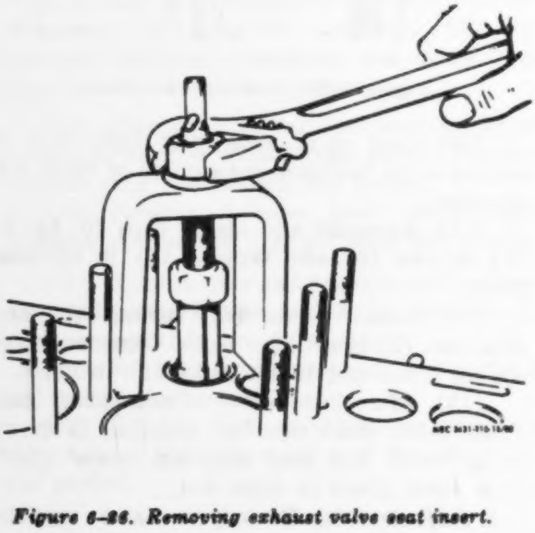


Figure 6–26. Removing exhaust valve seat insert.

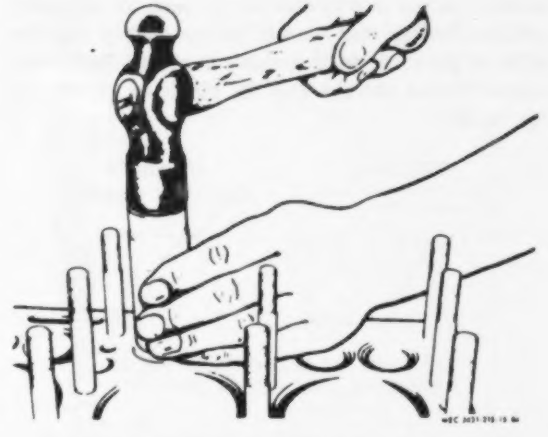


Figure 6-27. Installing exhaust valve insert.

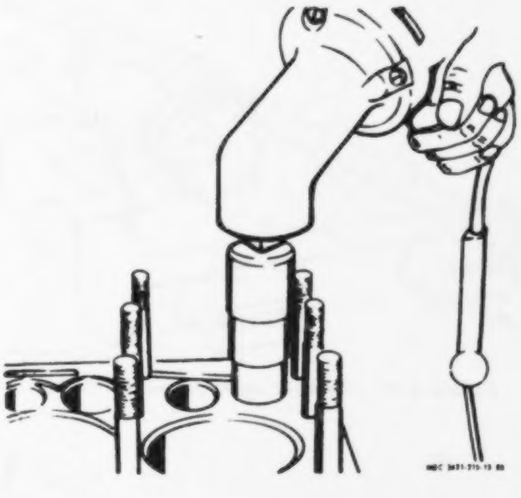


Figure 6-28. Grinding valve seat.

(10) Coat valve stem with light coat of engine oil to facilitate reassembly of valve mechanism.

(11) Assemble and install caps (5, fig. 6-11) screws (6) and tappets (7) in cylinder block.

(12) Install valves (4), springs (3) and retainers (2) in cylinder block. Compress valve spring lifter and insert locks (1) in place.

(13) After installation of crankshaft gear (para 6-10) check camshaft end play as shown in fig. 6-33. End play shall not exceed maximum limit given in table 5-1.

f. Adjustments. To adjust valve tappets, proceed as follows:

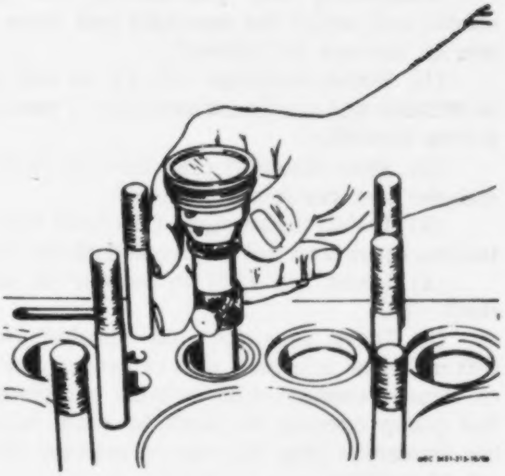


Figure 6-29. Indicating valve seat.

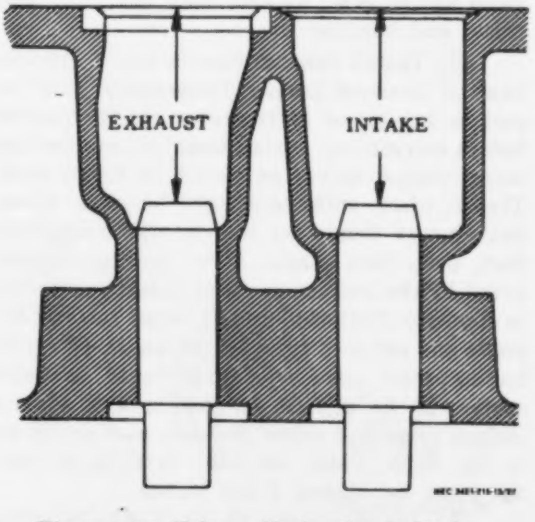


Figure 6-30. Valve guide location in block.

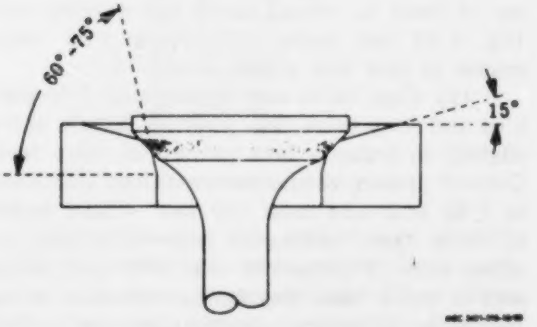


Figure 6-31. Narrowing valve seat.

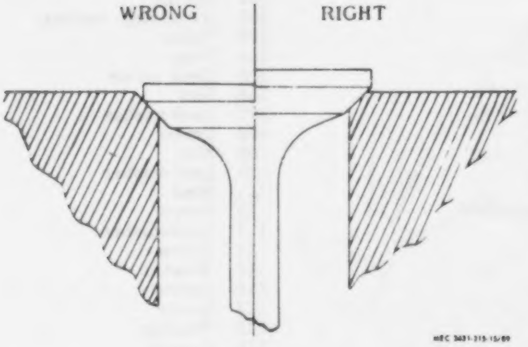


Figure 6–32. Valve position in block.

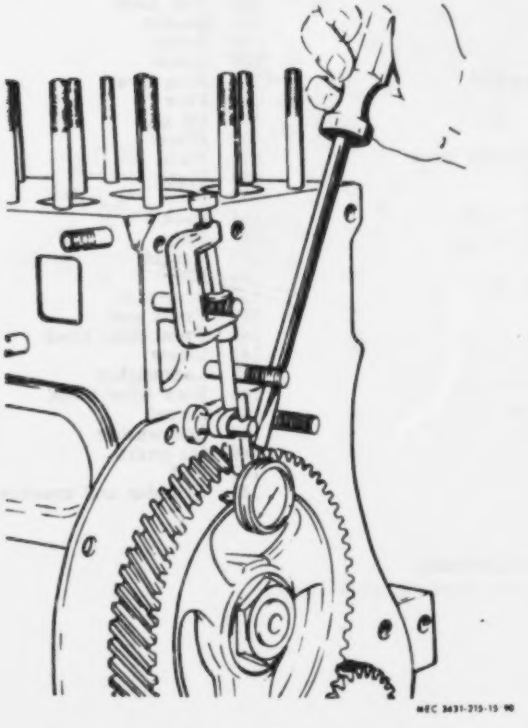


Figure 6–33. Checking camshaft end play.

(1) Remove valve chamber cover (para 3–60).

(2) Using two end wrenches and feeler gauge adjust each tappet adjusting screw so that slight drag is felt when 0.014-inch feeler gauge blade is withdrawn from between tappet and push rod (para 3–61).

(3) Leave valve chamber cover off so that tappet setting can be rechecked after testing procedure. After final check, replace valve chamber cover.

6–12. Cylinder and Crankcase Assembly

Note. These instructions apply to the engines on all three model welding machines. The engines are disassembled in a similar manner by referring to the appropriate illustration.

a. Removal and Disassembly (fig. 6–34).

(1) Remove enclosure (para 6–16).

(2) Remove spark plugs and leads (para 3–35).

(3) Remove magneto (para 3–33).

(4) Remove governor (para 3–28).

(5) Remove starter motor and solenoid switch (para 3–34).

(6) Remove battery charging generator (para 3–36).

(7) Remove water pump and fan assembly (para 3–41).

(8) Remove plug and drain oil from oil pan.

(9) Disconnect oil lines, remove cylinder head bolts, and remove oil filter.

(10) Remove nut and washer securing front motor mounts to support.

(11) Remove screws and washers securing rear engine mount to adapter plate.

(12) Remove nuts and washers securing generator frame to support.

(13) Remove engine and generator assembly from skid.

(14) Refer to paragraph 6–13 and perform the minimum steps necessary to enable removal of screws (45, fig. 6–39) and clips (46) and separate generator armature and supporting disk (51) from engine flywheel.

(15) Remove nuts and lockwashers from studs and remove water outlet elbow. Remove adapter ring, thermostat, and gasket.

(16) Remove cylinder head screws and washers and remove cylinder head and gasket.

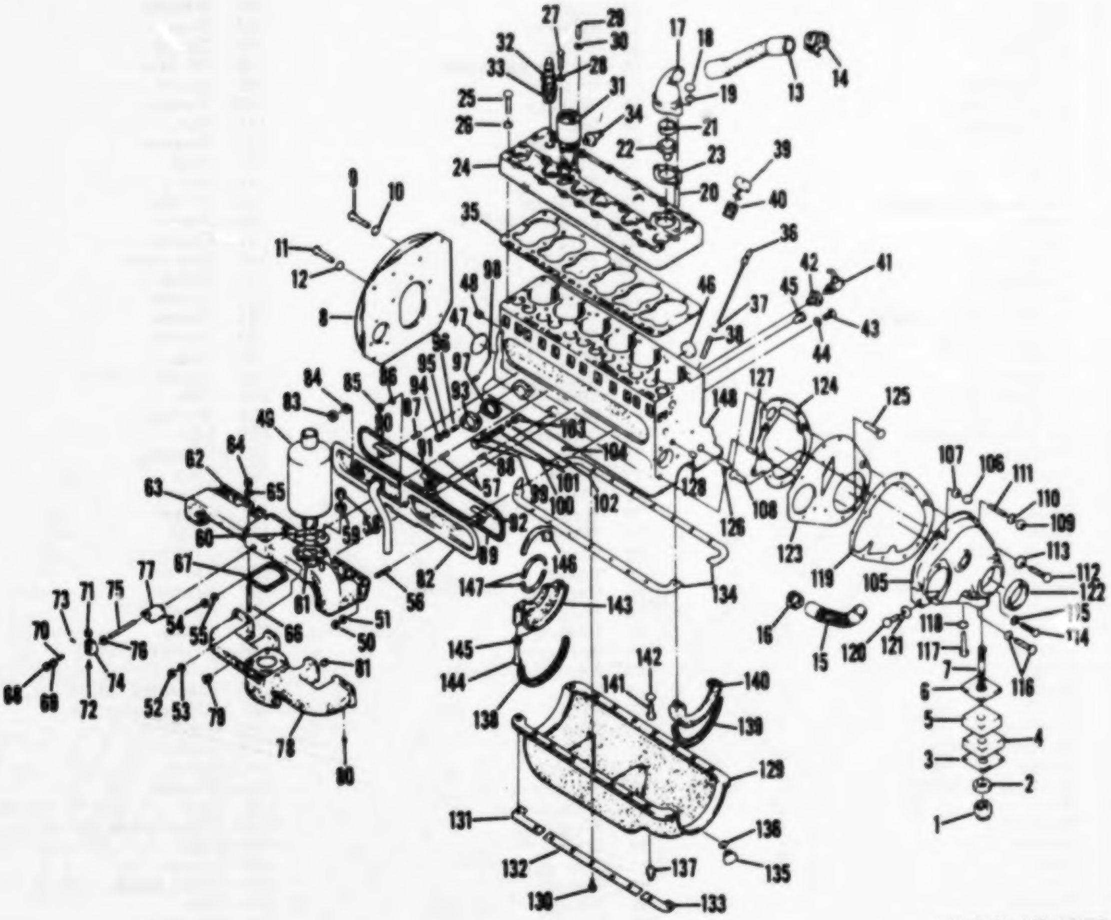
(17) Remove nuts and washers and remove manifold assembly and gasket. Do not remove studs unless they are damaged.

(18) Remove capscrews and lockwashers and remove fuel pump.

(19) Remove nuts and washers securing valve tappet chamber cover and remove cover and gasket.

1	Nut
2	Mount
3	Washer
4	Mount
5	Mount
6	Washer
7	Stud
8	Adaptor plate
9	Bolt
10	Lockwasher
11	Bolt
12	Lockwasher
13	Hose
14	Clamp
15	Hose
16	Clamp
17	Elbow
18	Nut
19	Lockwasher
20	Stud
21	Adaptor ring
22	Thermostat
23	Gasket
24	Cylinder head
25	Screw
26	Washer
27	Screw
28	Washer
29	Screw
30	Washer
31	Overspeed shutdown
32	Temperature sender
33	Bushing
34	Water temperature shutdown
35	Gasket
36	Oil-gauge rod
37	Support
38	Felt
39	Oil-filter cap
40	Nipple
41	Drain cock
42	Bushing
43	Screw
44	Washer
45	Plug
46	Plug
47	Plug
48	Plug
49	Muffler
50	Nut
51	Washer
52	Nut
53	Washer
54	Nut
55	Washer
56	Stud
57	Stud
58	Nut
59	Washer
60	Flange
61	Gasket
62	Gasket
63	Exhaust manifold
64	Nut
65	Washer
66	Stud
67	Gasket
68	Nut
69	Washer
70	Stud
71	Nut
72	Screw
73	Key
74	Sector
75	Shaft
76	Bushing
77	Valve
78	Intake manifold
79	Bushing
80	Plug
81	Plug
82	Tappet chamber cover
83	Nut
84	Gasket
85	Nut
86	Gasket
87	Stud
88	Stud
89	Gasket
90	Plate
91	Plate
92	Plate
93	Cover
94	Nut
95	Lockwasher
96	Stud
97	Gasket
98	Plug
99	Plug
100	Gasket
101	Spring
102	Adjusting washer
103	Valve
104	Plug
105	Gear cover
106	Nut
107	Lockwasher
108	Screw
109	Nut
110	Lockwasher
111	Stud
112	Screw
113	Lockwasher
114	Screw
115	Washer
116	Screw
117	Screw
118	Washer
119	Gasket
120	Screw
121	Washer
122	Oil Seal
123	End plate
124	Gasket
125	Screw
126	Dowel
127	Ring dowel
128	Plug
129	Oil pan
130	Screw
131	Plate
132	Plate
133	Plate
134	Gasket
135	Plug
136	Gasket
137	Plug
138	Rear seal
139	Front seal
140	Front filler block
141	Screw
142	Lockwasher
143	Rear filler block
144	Screw
145	Lockwasher
146	Oil guard
147	Felt
148	Cylinder and crankcase

*Figure 6-24*①—Continued.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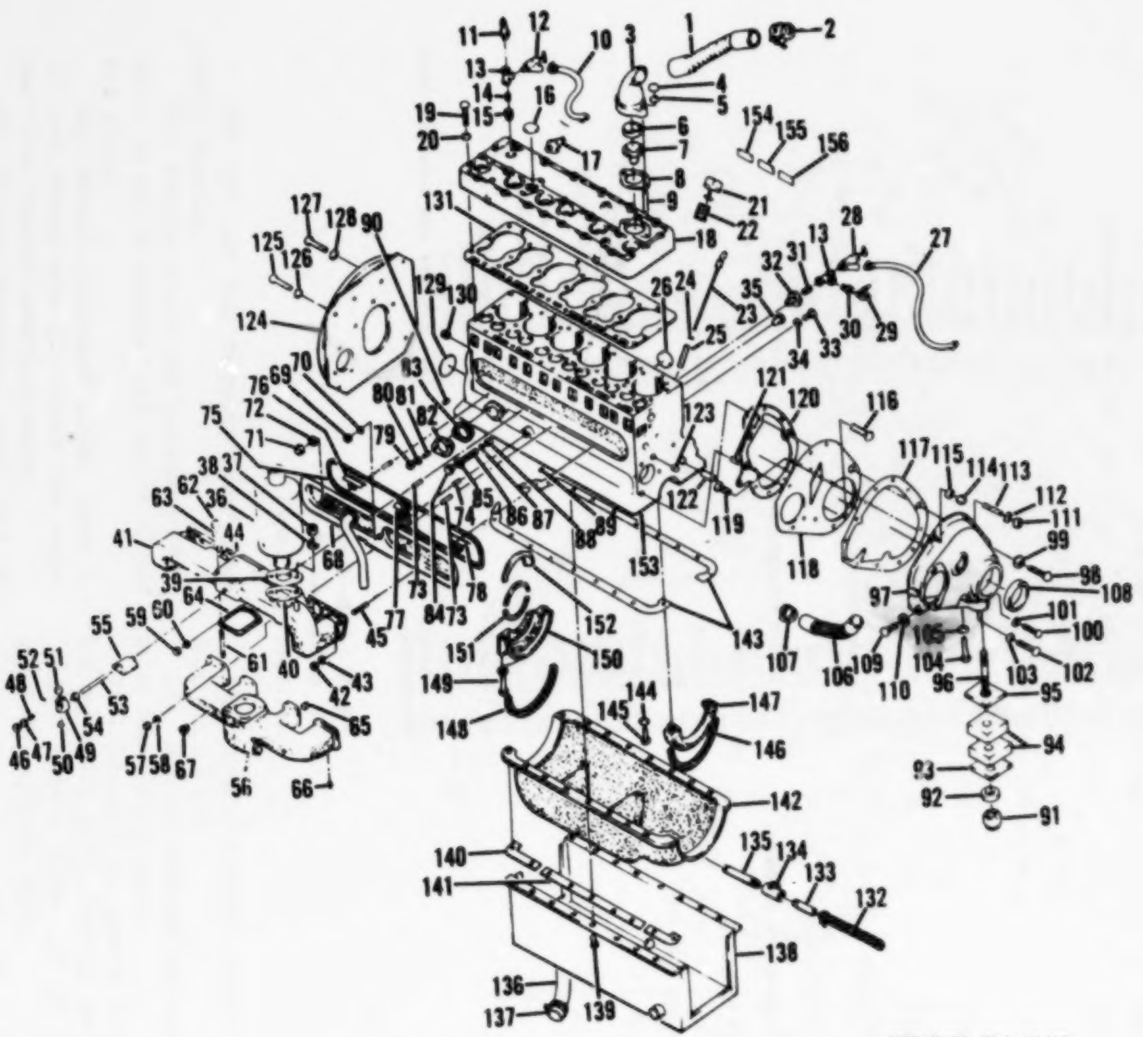
1 Model LE 800

Figure 6–34. Cylinder and crankcase, assembly and disassembly.

1	Hose
2	Clamp
3	Adapter
4	Nut
5	Lockwasher
6	Adapter ring
7	Thermostat
8	Gasket
9	Stud
10	Hose
11	Temperature sender
12	Valve
13	Tee
14	Nipple
15	Bushing
16	Plug
17	Thermostatic switch
18	Cylinder head
19	Screw
20	Washer
21	Oil filler cap
22	Nipple
23	Oil level dipstick
24	Washer
25	Support
26	Plug
27	Hose
28	Valve
29	Drain cock
30	Bushing
31	Nipple
32	Bushing
33	Screw
34	Washer
35	Plug
36	Muffler
37	Nut
38	Washer
39	Flange adaptor
40	Gasket
41	Exhaust manifold
42	Nut
43	Washer
44	Gasket
45	Stud
46	Nut
47	Washer
48	Stud
49	Head control weight
50	Screw
51	Nut
52	Key
53	Shaft
54	Bearing
55	Valve
56	Intake manifold
57	Nut
58	Washer
59	Nut
60	Washer
61	Stud
62	Nut
63	Washer
64	Gasket
65	Plug
66	Plug
67	Bushing
68	Lifter cover
69	Nut
70	Gasket
71	Nut
72	Gasket
73	Stud
74	Stud
75	Gasket
76	Baffle
77	Baffle
78	Plate
79	Nut
80	Washer
81	Stud
82	Cover
83	Gasket
84	Plug
85	Gasket
86	Spring
87	Adjusting washer
88	Valve
89	Plug
90	Plug
91	Nut
92	Mount
93	Washer
94	Mount
95	Washer
96	Stud
97	Gear cover
98	Screw
99	Washer
100	Screw
101	Washer
102	Screw
103	Washer
104	Screw
105	Washer
106	Hose
107	Clamp
108	Oil Seal
109	Screw
110	Washer
111	Nut
112	Washer
113	Stud
114	Nut
115	Washer
116	Screw
117	Gasket
118	End plate
119	Screw
120	Gasket
121	Dowel
122	Dowel
123	Plug
124	Adapter plate
125	Bolt
126	Washer
127	Bolt
128	Washer
129	Plug
130	Plug
131	Gasket
132	Hose
133	Nipple
134	Valve
135	Nipple
136	Hose
137	Clamp
138	Cover jacket
139	Bolt
140	Retaining plate
141	Retaining plate
142	Oil pan
143	Gasket
144	Screw
145	Washer
146	Seal
147	Filler block
148	Seal
149	Screw
150	Filler block
151	Felt
152	Oil guard
153	Engine block
154	Instruction decal
155	Instruction parts plate
156	Identification plate

Figure 6–34Ⓑ—**Continued.**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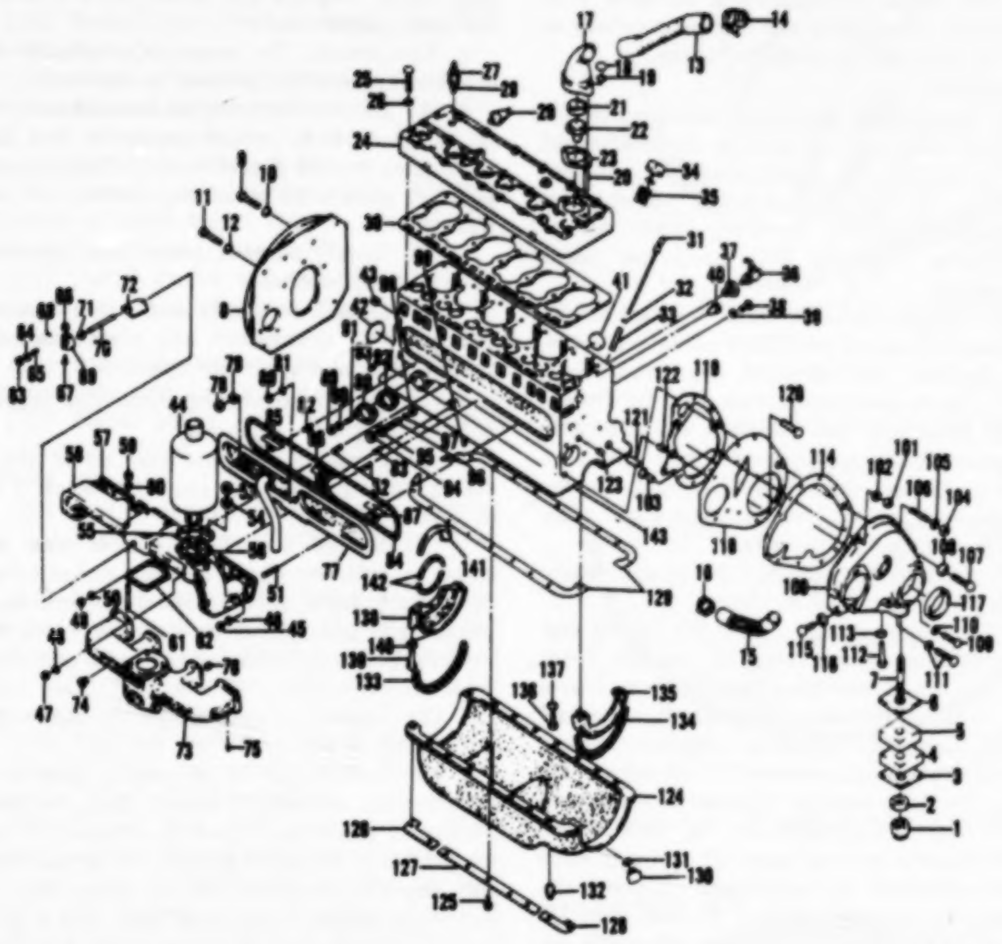
2 Model LEB 300

Figure 6–34—Continued.

1	Nut
2	Mount
3	Washer
4	Mount
5	Mount
6	Washer
7	Stud
8	Adaptor plate
9	Bolt
10	Lockwasher
11	Bolt
12	Lockwasher
13	Hose
14	Clamp
15	Hose
16	Clamp
17	Elbow
18	Nut
19	Lockwasher
20	Stud
21	Adaptor ring
22	Thermostat
23	Gasket
24	Cylinder head
25	Screw
26	Washer
27	Temperature sender
28	Bushing
29	Water temperature shutdown
30	Gasket
31	Oil gauge rod
32	Support
33	Felt
34	Oil filter cap
35	Nipple
36	Drain cock
37	Bushing
38	Screw
39	Washer
40	Plug
41	Plug
42	Plug
43	Plug
44	Muffler
45	Nut
46	Washer
47	Nut
48	Washer
49	Nut
50	Washer
51	Stud
52	Stud
53	Nut
54	Washer
55	Flange
56	Gasket
57	Gasket
58	Exhaust manifold
59	Nut
60	Washer
61	Stud
62	Gasket
63	Nut
64	Washer
65	Stud
66	Nut
67	Screw
68	Key
69	Sector
70	Shaft
71	Bushing
72	Valve
73	Intake manifold
74	Bushing
75	Plug
76	Plug
77	Tappet chamber cover
78	Nut
79	Gasket
80	Nut
81	Gasket
82	Stud
83	Stud
84	Gasket
85	Plate
86	Plate
87	Plate
88	Cover
89	Nut
90	Lockwasher
91	Stud
92	Gasket
93	Plug
94	Plug
95	Gasket
96	Spring
97	Adjusting washer
98	Valve
99	Plug
100	Gear cover
101	Nut
102	Lockwasher
103	Screw
104	Nut
105	Lockwasher
106	Stud
107	Screw
108	Lockwasher
109	Screw
110	Washer
111	Screw
112	Screw
113	Washer
114	Gasket
115	Screw
116	Washer
117	Oil seal
118	End plate
119	Gasket
120	Screw
121	Dowel
122	Ring dowel
123	Plug
124	Oil pan
125	Screw
126	Plate
127	Plate
128	Plate
129	Gasket
130	Plug
131	Gasket
132	Plug
133	Rear seal
134	Front seal
135	Front filler block
136	Screw
137	Lockwasher
138	Rear filler block
139	Screw
140	Lockwasher
141	Oil guard
142	Felt seal
143	Cylinder and crankcase block

*Figure 6–34*②—Continued.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b Model LEW 800

Figure 6-24—Continued.

(20) Lift out hole plugging plates from tappet chamber.

(21) Remove screws and lockwashers that secure oil pan to crankcase and remove oil pan and gasket.

(22) Remove crankshaft pulley (para 6-10) and remove nuts and screws that secure gear cover. Remove cover and gasket.

(23) Remove crankshaft gear and oil thrower (para 6-9) and camshaft and valves (para 6-11).

(24) Remove screws and washers and remove front end plate.

(25) Remove flywheel, crankshaft and pistons (para 6-10).

(26) Remove bolts and lockwashers and remove rear adapter plate.

(27) Unscrew and remove oil pressure relief valve plug, gasket, spring, and valve.

(28) Remove water and oil passage pipe plugs from cylinder block.

b. Cleaning. Clean all parts in solvent. Use wire brush to remove dirt and corrosion. Steam clean block and blowout all passages with compressed air. Carefully wipe out cylinder bores with solvent-dampened cloth and dry with lint free cloth. Clean gasket seating surfaces with scraper and compressed air. Scrape carefully so as not to damage machined surfaces.

c. Inspection.

(1) Inspect oil pressure relief valve for scoring or wear and remaining parts of relief valve assembly for good condition. Inspect valve cover for dents, cracks, and warping. Inspect engine mounts for wear, splitting, or deterioration. Examine gear cover for dents and warping.

(2) Inspect cylinder head for carbon deposits and flatness of machined mounting faces. Check flatness with straight edge and feeler gauge in three positions across narrow dimensions of head and five positions along length. Low spots should not exceed limits given in table 5–1. Inspect gasket seating surfaces for cleanliness and smoothness. Inspect spark plug holes for damage to threads.

(3) Inspect oil pan for dents and leaks. Inspect plates for good condition.

(4) Inspect cylinder blocks for cracks and good condition. Clean ring of carbon from around top of cylinder bore formed above travel of top ring. Determine original diameter of cylinder barrel by checking cleaned unworn area with inside micrometer at 45-degree intervals. Check in similar manner diameter of cylinder barrel approximately ¼ inch below shoulder caused by ring area. If cylinder bore wear as indicated by maximum difference in above checks exceeds 0.008 or if maximum ID of worn area exceeds maximum allowable on engine never rebored, cylinders need reboring. If limits of cylinder wear are not exceeded, replacement of piston rings will suffice.

d. Repair. Ridge ream cylinders to remove unworn area at top before installing new rings. If installing new rings, remove glaze on cylinder walls by using glaze breaker to insure quick seating of rings. Surface hone each cylinder several times. Move glaze breaker up and down in cylinder rapidly to produce 45-degree crosshatch pattern. Clean brush. Dry glaze breaker before moving to next cylinder. Most desirable finish can be obtained by using 220 grit stones on glaze breaker. Clean all bores thoroughly with clean oiled cloth to pick up particles of dust that may be embedded in walls. Then wipe with clean, dry lint-free cloth. Straighten dents in valve cover, oil pan and gear cover. Replace any other parts which do not pass inspection.

e. Reassembly. To reassemble cylinder and crankcase assembly, proceed as follows:

(1) Before mounting gasket and end plate on cylinder block, cement gasket to end plate with quick drying gasket cement. Install gasket and end plate with attaching screws and lockwashers.

(2) Install adaptor plate with attaching bolts and lockwashers.

(3) Install camshaft and valve assembly (para 6–11), crankshaft and piston assembly (par 6–10), and oil pump (para 6–9).

(4) Install dowels and three pipe plugs on front of engine if removed.

(5) Press oil seal into gear cover and install plugging screw and copper washer in side of cover.

(6) Before mounting gasket and gear cover on cylinder block, cement gasket to gear cover with quick drying gasket cement. Install gasket and gear cover on cylinder block with attaching screws, washers and nuts, and copper washers.

(7) Install crankshaft pulley outlined in paragraph 6–10.

(8) Install seal in oil guard. Seal in approximately one-third larger than width of groove in guard and must be crushed or hammered flat to fit guard groove. After flattening, use smooth, rounded tool to press seal into groove as shown in fig. 6–35 until seal is firmly seated. Install seal in lower rear filler block (fig. 6–36) in similar manner. After seating seals, cut off seals 1/32 inch from end of casting. Use sharp knife or razor blade and make cut parallel to surface of casting.

(9) Cement seal with small spot of nonhardening cement to rear filler block as shown in figure 6–37.

(10) Install oil guard and filler block on crankcase with attaching screws and lockwashers.

(11) Cement seal to front filler block in same manner in which seal was installed in rear filler block, and install front filler block.

(12) Install gasket and plug in oil pan.

(13) Install gaskets, oil pan and retaining plates with eighteen attaching screw and lockwasher assemblies.

(14) Install pipe plugs in lower manifold side of crankcase.

(15) Install oil pressure relief valve assembly consisting of valve, washers, spring, gasket, and valve plug in cylinder block in sequence shown in figure 6–38.

(16) Install hole plugging plates in holes in bottom of valve tappet chamber in cylinder block. Adjust valves (para 3–60).

(17) Install gasket and valve tappet chamber cover on three attaching studs with nuts and gaskets.

(18) Install gasket and fuel pump on attaching studs with two nuts and washers.

(19) Install gasket and manifold assembly on cylinder block with attaching studs, washers, and nuts.

(20) Install temperature sender bushing and water temperature shutdown in cylinder head.

(21) Install gasket and cylinder head on cylinder block with attaching screws and flat washers. See figure 3–32 for cylinder head screw tightening sequence and table 5–1 for torque wrench tension.

(22) Position gasket on studs and install thermostat, ring, and water outlet elbow with attaching nuts and lockwashers.

(23) Screw stud into gear cover. Slide washers square mounts and round mount on stud and turn a few turns on stud to hold mounts and washers on stud until engine and welding generator are mounted on frame.

(24) Install water pump and fan assembly in accordance with paragraph 3–41.

(25) Install spark plugs and leads in accordance with paragraph 3–35.

(26) Install magneto in accordance with paragraph 3–33.

(27) Install starter motor and solenoid switch in accordance with paragraph 3–34.

(28) Install battery charging generator in accordance with paragraph 3–36.

(29) Install governor in accordance with paragraph 3–28.

(30) Install carburetor in accordance with paragraph 3–24.

(31) Install the enclosure (para 6–16).

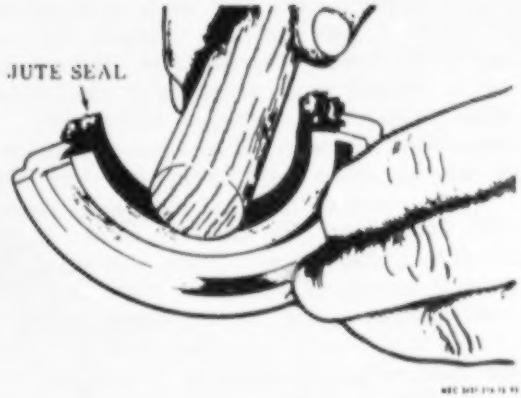

Figure 6–35. Installing jute seal in rear guard.

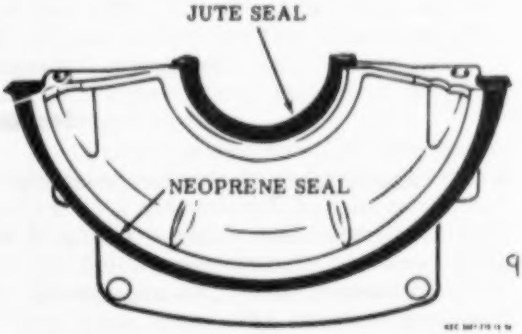

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Figure 6–36. Oil seals in rear filler block.

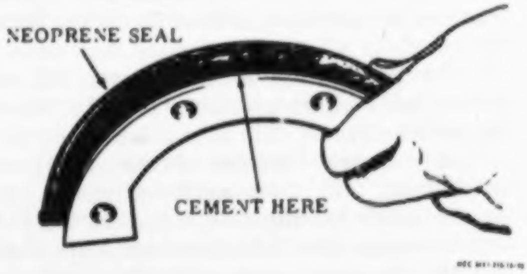


Figure 6–37. Installing neoprene seal on rear filler block.

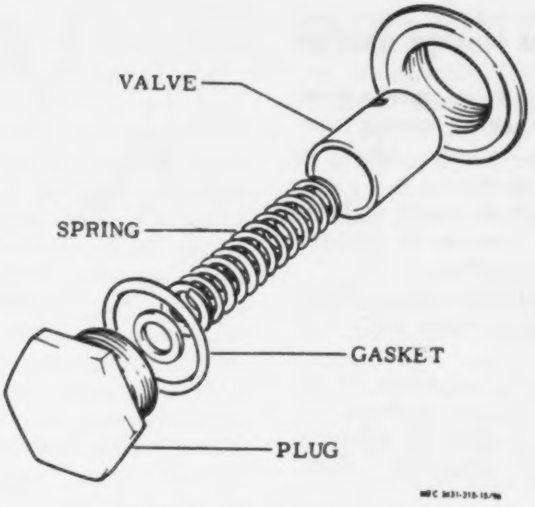


Figure 6–38. Oil pressure relief valve, exploded view.

Section V. WELDER

6–13. Arc-Welding Generator Assembly

a. Removal and Disassembly.

(1) Remove exciter cover (1, fig. 6–39) after removing attaching screw (2).

(2) Remove screw (3) and washer (4) from exciter frame (5).

(3) Remove exciter frame attaching screws (6) and washer (7).

(4) Holding exciter brushes (11) away from exciter armature (18) slide exciter frame (5) carefully off armature.

(5) Remove exciter pole pieces (8) and exciter pole coil from exciter frame by removing screw (9).

(6) Remove exciter brush (11) and brushholder (12) from exciter frame.

(7) Slide bearing case (13), bearing (14) and clamping ring (15) from armature shaft.

(8) Remove cover (16) by removing screws (17).

(9) Bend corners of clips (20) straight and remove armature (18) after removing screw (19).

(10) Remove exciter fan (21) from generator armature shaft by removing setscrews (22 and 23).

(11) Remove key (24) from exciter fan (21).

(12) Remove outer dust cap (25) and gasket (27) after removing screw (26).

(13) Remove generator bracket (28) after removing screws (29) and washers (30).

(14) Remove screws (32), washers (33) and nuts (34) from generator frame (31) and carefully slide frame (31) from armature (44).

(15) Remove main pole piece (35), shunt field coil (36) interpole pole piece and coil (37) and series field coil (38) from frame (31).

(16) Remove brushholder rocker (39) after removing screw (40) and washer (41).

(17) Pull bearing (42) from armature shaft with a suitable puller and slide gasket (27) and dust cap (43) from shaft.

(18) Bend corners of locking clips (46) straight and while supporting armature remove screws (45) and slide armature away from engine.

(19) Bend corners of locking clips (49) straight and remove coupling ring (47) after removing screws (48) and clips (49).

(20) Slide disc backing plate (50), disc (51), and blower fan (52) from armature (44).

b. Cleaning. Wipe covers (1 and 16), end bracket (28) and frame (31) with solvent-dampened cloth. Clean commutator with No. 00 sandpaper and finish cleaning with vacuum line. Blow out coil assemblies with compressed air. Wipe dirt and excess grease from bearing (14 and 42) with clean, lint-free cloth. Clean exciter commutator with No. 00 sandpaper and finish cleaning with vacuum line.

c. Inspection. Inspect armature (44) and coils (36, 37 and 38) for shorts, opens and grounds in manner similar to that outlined in para 6–3 for battery charging generator. Inspect commutator for roughness, high mica, and out-of-round condition. If slightly rough, commutator can be reconditioned with No. 00 sandpaper. For correction of other conditions, turn commutator down in lathe until smooth and concentric with shaft, then undercut mica to depth of 1/8 inch. Remove any burred edges with No. 00 sandpaper. Check bearing (42) and dust caps (25 and 43) for good condition. Inspect clips (49), coupling ring (47) discs (50 and 51) and fan (52) for good condition. Inspect rocker (39) for good condition.
Inspect exciter brushes (11), armature (18) and field coils (10) in manner similar to that outlined for battery charging generator. Inspect commutator for roughness, high mica, and out-of-round condition. If necessary, correct those conditions the same as for the welding generator. Inspect brushholder (12) for wear.

d. Repair. Replace armature (44) or coils (36, 37 and 38) which are defective and cannot be easily repaired. Turn down commutator in lathe if rough or worn out-of-round and undercut mica to depth of 1/8 inch if high. Straighten fan (52) blades if bent. Replace any other parts which do not pass inspection. Replace exciter brushes (11) if worn to less than 1/2 inch. Replace armature (18) or field coils (10) which are defective and cannot be easily repaired. Turn down commutator in lathe if rough or out-of-round and undercut mica to depth of 1/8 inch if high. Replace any other parts which do not pass inspection.

e. Reassembly and Installation. To reassemble and install the arc welding generator assembly, proceed as follows:

(1) Mount engine on suitable support to engage generator. Support armature (44) free of floor with rope or chain hoist. If using chain hoist, support armature in rope cradle to prevent damage to armature.

(2) Slide blower fan (52), disc (51) and disc backing plate (50) onto armature shaft.

(3) Install coupling ring (47) with screws (48) and clip (49). Bend down corners of locking clip over screw heads.

(4) While supporting armature, slide armature toward engine and attach with screw (45) and clip (46). Bend down corners of locking clips over heads of screws.

(5) Slide dust cap (43) and gasket (27) onto armature shaft. Place bearing (42) on armature shaft and drive by gently tapping with wooden mallet or rubber headed hammer to protect bearing.

(6) Install brushholder rocker with attaching screw (40) and washer (41).

(7) Install main pole piece (35), shunt field coil (36), interpole pole piece and coil (37) and series field coil (38) into frame (31) by gently tapping onto position with block of wood and hammer, being careful to keep field coils in proper position.

(8) Carefully slide frame (31) over armature (44) and secure with screws (29) and washers (30).

(9) Install gasket (27) and outer dust cap (25) with screw (26).

(10) Install key (24)on exciter fan (21).

(11) Slide exciter fan (21) on generator armature shaft and tighten set screws (22 and 23)

(12) Install exciter armature (18) with screw (19) and lock clips (20). Bend corner of clips over screw heads.

(13) Install cover (16) with screw (17).

(14) Install clamping ring (15), bearing (14) and bearing case (13) on armature shaft.

(15) Install brush (11) and brushholder (12) on exciter frame.

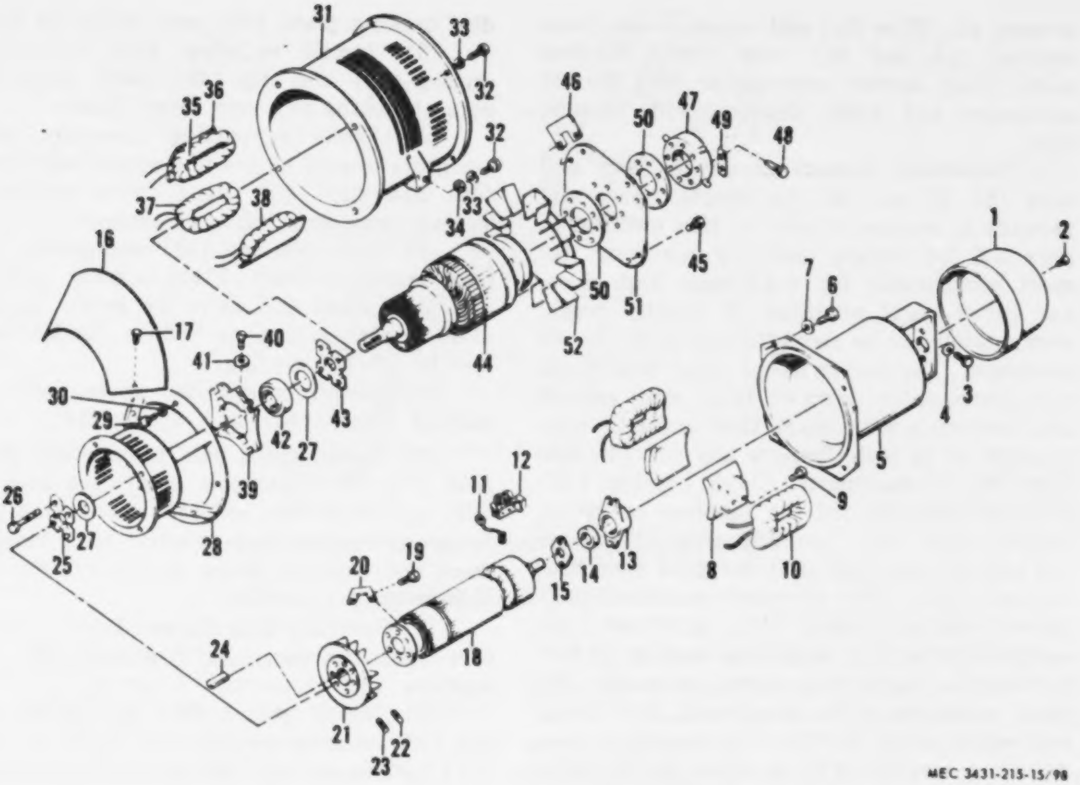
(16) Install pole pieces (8) and exciter pole coil on exciter frame with screw (9).

(17) Holding exciter brush (11) back, carefully slide exciter frame (5) over armature shaft. Release brushes against armature.

(18) Install exciter frame attaching screws (6) and washer (7).

(19) Install exciter cover (1) and tighten attaching screw (2).

(20) Place rope or chain hoist capable of supporting 1800 pounds around nut (fig. 6–34), mount washers and mounts from stud. Hoist assembly into position over frame and slowly and carefully lower assembly onto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1	Exciter cover	27	Gasket
2	Screw	28	Generator bracket
3	Screw	29	Screw
4	Washer	30	Washer
5	Exciter frame	31	Generator frame
6	Screw	32	Screw
7	Washer	33	Washer
8	Exciter pole piece	34	Nut
9	Screw	35	Main pole piece
10	Exciter pole coil	36	Shunt coil
11	Exciter brush	37	Pole piece and coil
12	Brushholder	38	Series coil
13	Bearing case	39	Brushholder rocker
14	Exciter bearing	40	Screw
15	Clamping ring	41	Washer
16	Cover	42	Bearing
17	Screw	43	Inner dust cap
18	Exciter armature	44	Generator armature
19	Screw	45	Screw
20	Clip	46	Clip
21	Fan	47	Coupling ring
22	Setscrew	48	Screw
23	Setscrew	49	Clip
24	Key	50	Disk backing plate
25	Outer dust cap	51	Disk
26	Screw	52	Blower fan

Figure 6–39. Welding generator, assembly and disassembly.

frame making sure stud on gear cover is aligned with hole in frame. Before inserting stud in hole in frame, assemble washer (fig. 6–34) and mounts on stud. Lower engine and generator assembly onto frame and attach engine with mount (4), washer (3) and nut (1). Attach generator frame (31, fig. 6–39) to frame with attaching bolts (32), washers (33) and nuts (34). Insert battery ground cable between washer (33) and frame.

Section VI. CONTROL PANEL

6–14. Control Panel Assembly

a. Removal and Disassembly. To remove and disassemble control panel assembly, proceed as follows:

(1) Refer to paragraph 3–21 to remove and install control panel.

(2) Disconnect electrical wiring to panel component. Tag all leads to facilitate reinstallation.

(3) Remove polarity switch (17, fig. 6–40) by removing polarity switch plate (18) and screws (19).

(4) Remove circuit breaker (49) by removing screws (50), washers (51 and 52) and nut (53).

(5) Remove remote plug (20) by removing screw (21).

(6) Remove resistor (26) by removing screw (27), washer (28) and nut (29).

(7) Remove resistor bracket (30) by removing screw (31), washer (32) and nut (33).

(8) Remove outlet receptacle (44) and capacitor (46) by removing screw (45), washers (47) and nuts (48).

(9) Remove switch (25) and resistor (73).

(10) Remove hourmeter (13) by removing screws (14), washers (15) and nuts (16).

(11) Remove auxiliary generator voltmeter (9), auxiliary generator ammeter (8), welding generator voltmeter (7) and welding generator ammeter (6) by removing screw (10), washer (11) and nut (12).

(12) Remove battery charging ammeter (75) fuel gauge (74), water temperature indicator (76) and oil pressure gauge (77) from panel.

(13) Remove remote switch (22), magneto switch (36), starter switch (35) and choke control (37) from panel.

(14) Remove rheostat (43) by removing voltage dial plate (40), screw (41) and washer (42).

(15) Remove current plate (4) by removing screw (3).

(16) Remove shunts (54 and 69) by removing screws (55 and 70), washers (52 and 71) and nuts (57 and 72).

b. Cleaning. Wipe panel, dials (4, 18, and 40) and gauges and meters with solvent-dampened cloth and dry with clean, lint-free cloth. Clean switches (22, 35 and 36) with compressed air. Clean all threaded parts in solvent, using brush if necessary and dry thoroughly. Wipe power outlets with clean, lint-free cloth.

c. Inspection. Inspect panel for dents and cracks. Inspect gauges and meters for cracked or broken glass and defaced dials. Inspect electrical terminals for corrosion and damaged threads. Inspect rheostat for burned or blackened areas and open turns. Inspect switch for pitted and corroded contacts. Inspect choke cable for kinks and free movement of control wire inside cable. Check wiring harness for good condition and missing lugs or cable clamps.

d. Repair. Straighten panel if dented or warped. Replace any defective leads in wiring harness with same size and length of wire and tie new lead to harness at six-inch intervals. If contacts of switch are slightly pitted or blackened, clean with No. 00 sandpaper. Replace all other parts which do not pass inspection.

e. Reassembly and Installation. To reassemble and install control panel assembly, reverse removal and disassembly procedure.

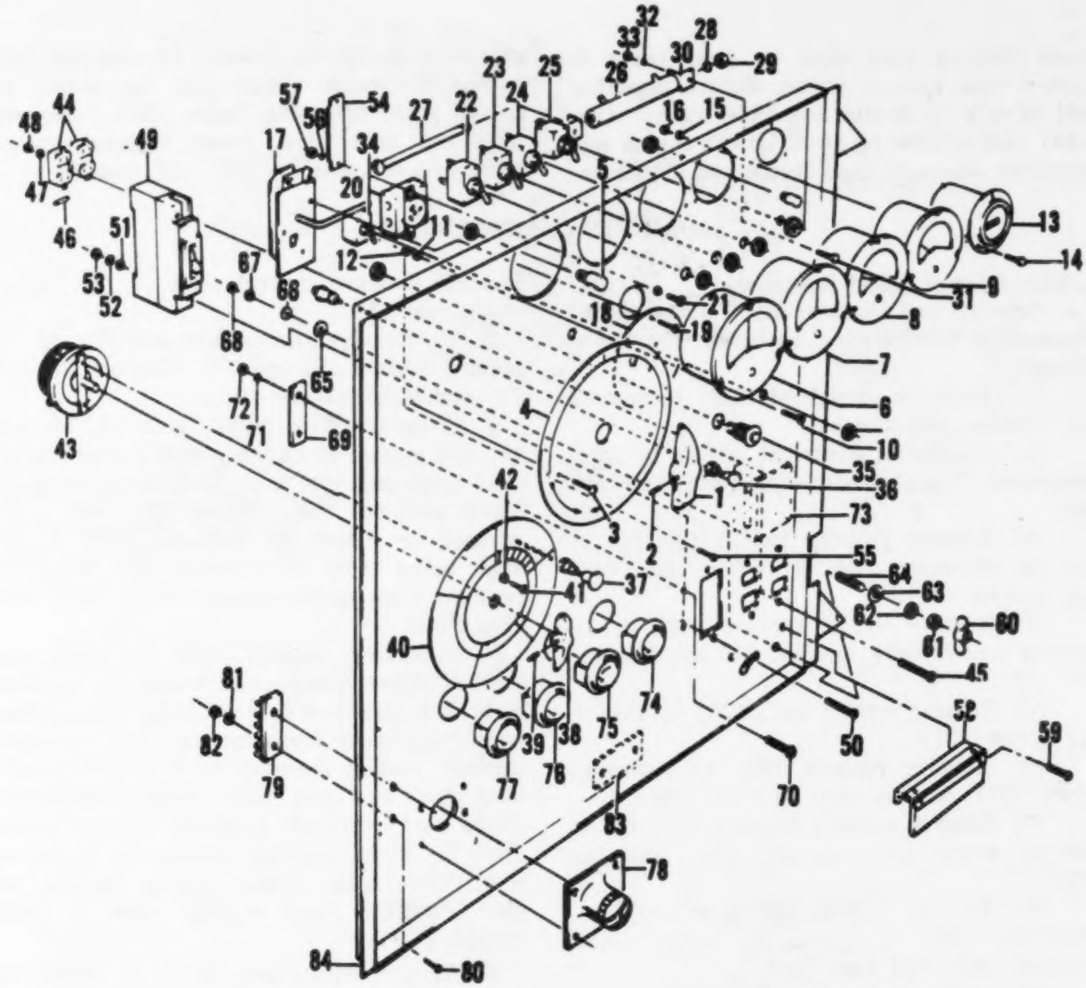
6–15. Current Control

a. Removal and Disassembly.

(1) Loosen two set screws (1, fig. 6–41) in current control handle (2) and slide handle from shaft.

(2) Remove control panel in accordance with procedure in paragraph 6–14.

(3) Remove nut (3) and disconnect cables at rear of current control.



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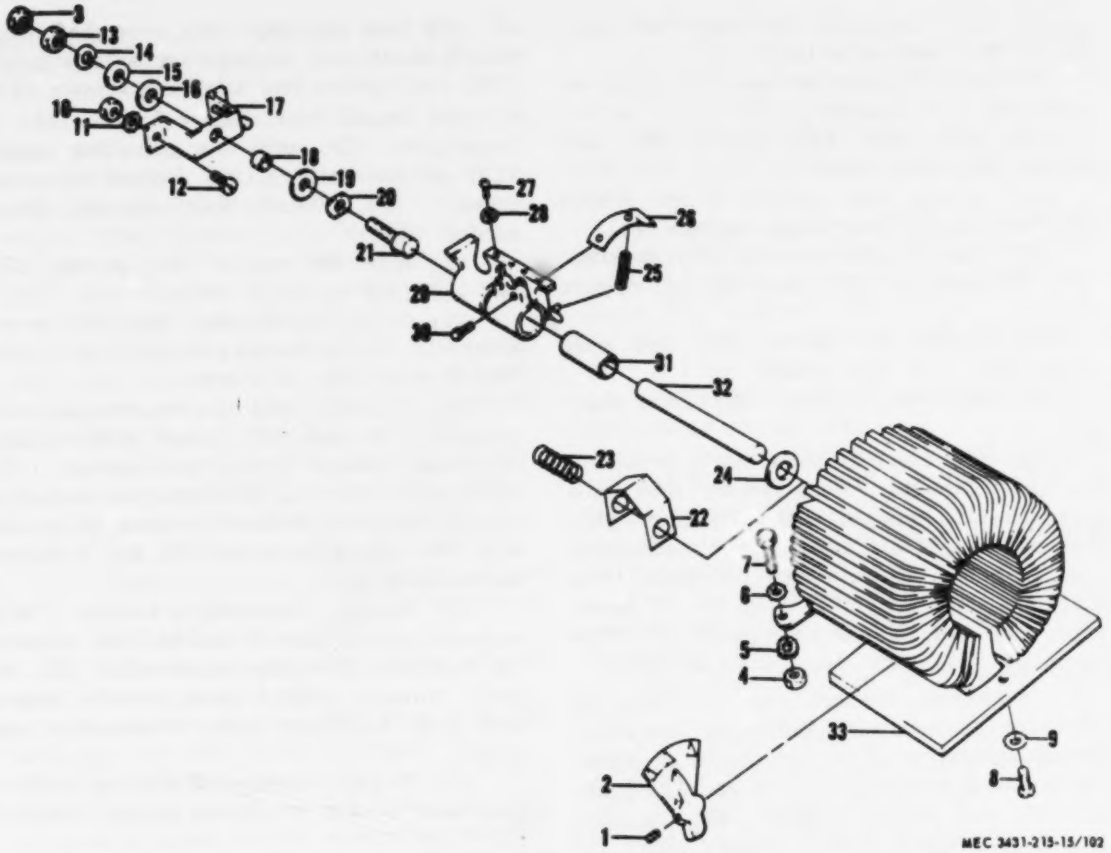
1	Knob
2	Set screw
3	Screw
4	Current control plate
5	Panel light
6	Welding generator ammeter
7	Welding generator voltmeter
8	Auxiliary generator ammeter
9	Auxiliary generator voltmeter
10	Screw
11	Washer
12	Nut
13	Engine hourmeter
14	Screw
15	Washer
16	Nut
17	Polarity switch
18	Polarity switch plate
19	Screw
20	Remote control receptacle
21	Screw
22	Remote switch
23	Idle control switch
24	Panel light switch
25	Overspeed reset switch
26	Resistor
27	Screw
28	Washer
29	Nut
30	Bracket
31	Screw
32	Washer
33	Nut
34	Hold down to start switch
35	Start switch
36	Magneto switch
37	Choke
38	Handle
39	Set screw
40	Job selector panel
41	Screw
42	Washer
43	Rheostat
44	Receptacle
45	Screw
46	Capacitor
47	Washer
48	Nut
49	Circuit breaker
50	Screw
51	Washer
52	Washer
53	Nut
54	Shunt
55	Screw
56	Washer
57	Nut
58	Cover
59	Screw
60	Wing nut
61	Nut
62	Washer
63	Washer
64	Stud
65	Washer
66	Washer
67	Nut
68	Nut
69	Shunt
70	Screw
71	Washer
72	Nut
73	Resistor
74	Fuel level gauge
75	Battery indicator
76	Water temperature gauge
77	Oil pressure gauge
78	Connector
79	Terminal board
80	Screw
81	Washer
82	Nut
83	Terminal board
84	Panel

Figure 6-40. Control panel, assembly and disassembly.



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1	Set screw
2	Handle
3	Nut
4	Nut
5	Lockwasher
6	Lockwasher
7	Screw
8	Screw
9	Lockwasher
10	Nut
11	Lockwasher
12	Screw
13	Nut
14	Lockwasher
15	Washer
16	Insulating washer
17	Bracket
18	Bushing
19	Insulating washer
20	Washer
21	Stud
22	Clip
23	Spring
24	Washer
25	Spring
26	Contact finger
27	Screw
28	Lockwasher
29	Brushholder
30	Screw
31	Insulation tube
32	Shaft
33	Reactor

Figure 6-41. Current control, assembly and disassembly.

(4) Remove nut (4), lockwashers (5 and 6) and screw (7) and disconnect cables at terminal on side of current control.

(5) Remove four attaching bolts, lockwashers and nuts from current control mounting bracket and carefully slide bracket with mounted current control assembly from unit. Press shaft through control panel while sliding bracket from unit.

(6) Remove two screws (8) together with lockwashers (9) to separate reactor from mounting bracket.

(7) Remove two nuts (10), lockwashers (11) and screws (12) attaching stud and bracket assembly to mounting brackets.

(8) Remove stud and bracket assembly and separate nut (13), lockwasher (14), flat washer (15), insulating washers (16 and 19)

bracket (17) insulating bushing (18), stud washer (20) and stud (21).

(9) Slide brushholder assembly from reactor (33) and separate parts.

(10) Slide clip (22), spring (23) and washer (24) from shaft.

(11) Loosen four contact finger screws (27) and remove four finger springs (25).

(12) Remove four screws (27) together with lockwashers (28) and lift off fingers (26).

(13) Loosen two screws (30) and slide brushholder (29) from shaft.

(14) Separate insulator (31) from shaft (32).

b. Cleaning. Clean all metal parts in solvent and dry thoroughly. Wipe reactor (33) coils with solvent dampened cloth. Dry thoroughly with compressed air, blowing out inaccessible coils with air. Remove any corrosion from shaft (32) and stud (21) with No. 00 sandpaper and blow off with compressed air. Wipe insulation (31) with clean, lint-free cloth.

c. Inspection. Inspect reactor (33) for pitted or burned posts indicating arc-overs. Inspect insulation (31), for cracks or splits. Inspect insulating washers (16 and 19) bushing (18) and contact springs (25) for good condition. Inspect contact fingers (26) for burning, pitting, and wear; particularly uneven wear indicating faulty adjustment.

d. Repair. If contact fingers (26) and reactor (33) are slightly pitted or burned, clean with fine-cut file and No. 00 sandpaper. If extensively pitted or burned, replace. Replace all other parts which do not pass inspection.

e. Reassembly and Installation. To reassemble and install current control assembly, proceed as follows:

(1) Slide insulator (31) over shaft (32). Insert shaft and insulator into brushholder (29) and tighten two attaching screws (30).

(2) Install four contact fingers (26) on brushholder (29) with four attaching screws (27) and lockwashers (28). Before tightening screws (27), install four contact finger springs (25).

(3) Assemble washer (24), spring (23), and clip (22) on shaft (32).

(4) Install brushholder assembly in reactor (33). Avoid bending or twisting contact fingers more than necessary.

(5) Assemble stud and bracket assembly consisting of stud (21), stud washer (20), insulating washer (16), flat washer (15), lockwasher (14) and nut (13) and install on vertical mounting brackets welded to bracket with two attaching screws (8, fig. 6–41 and lockwashers (9).

(6) Install mounting bracket with mounted current control assembly on supporting brackets. Carefully insert shaft (32, fig. 6–41) through control panel. Secure bracket with four attaching bolts, lockwashers and nuts.

(7) Connect double cable from welding generator to rear of current control with nut (3)

(8) Connect single cable from welding generator to terminal on side of current control loosely with screw (7), lockwashers (5 and 6) and nut (4). Connect cable from electrode welding terminal to terminal on side of current control and secure with screw (7), lockwashers (5 and 6) and nut (4).

(9) Install control panel in accordance with para 6–14.

(10) Slide handle (2) on shaft. Tighten set screw (1).

Section VII. ENCLOSURE (Model LEB 300)

6–16. Enclosure

a. Removal. To remove the enclosure, proceed as follows:

(1) Remove side doors (1, fig. 6–42) by removing screws (2), screw (3), and nuts (4), then remove top panel (5) by removing screw (6) and nut (7).

(2) Remove exhaust tube (8), clamps (9 and 10), metal hose (11) and elbow (12), then remove rain cap (13) by removing screw (14), and (15), and cotter pin (16).

(3) Remove top radiator hose (17) and bottom radiator hose (18) by removing clamps (19).

(4) Remove instrument panel (20), then remove cover (21) by removing screw (22). Remove ground strap (23).

(5) Remove connector (24)by removing

screw (25), washer (26) and nut (27). Remove panels (28 and 29) by removing screw (30) and nut (31).

(6) Remove door jam (32) by removing screw (33) and nut (34).

(7) Remove battery retainer (35) by removing holddown stud (36), nut (37), and washer (38). Remove batteries (39).

(8) Remove battery box (40) from rails (82), then remove radiator shell (43). Remove door (46) from shell (43).

(9) Remove radiator (49) and cap (50), then remove shroud (51) from radiator.

(10) Remove bracket (53) by removing screw (54) washer (55) and nut (56).

(11) Remove tank (57) and strainer (58) from rails (59 and 60), then remove rails.

(12) Remove brackets (61 and 62) then remove hose (63), clamp (64) and hose (65).

(13) Remove bracket (66) and remote box (67), then remove cover (68) by removing screw (69) and washer (70).

(14) Remove panel (71), then remove shell (75) from skid (79).

(15) Remove drip pan (78) from skid (79) and drip rail (80) from top panel (5).

b. Cleaning. Wipe grease, dirt and dust from panels and doors with solvent dampened cloth. Wipe oil drip pan, shutter assemblies and shell assemblies with solvent dampened cloth. If particularly dirty, clean enclosure and frame with live steam and solvent before wiping with cloths.

c. Inspection. Inspect doors, panels, frames, brackets, and shell assemblies for breaks, dents, cracks, or damaged paint. Make sure doors close securely and latches operate properly. Inspect lifting frame for broken or cracked welds and stretched or broken attaching screw holes and lifting eye.

d. Repair. Straighten bent doors and panels and weld members. Replace defective door latches. Replace defective shutter assemblies as a unit. Repair small leaks in radiator with solder. Do not permit solder to flow into radiator core. If radiator is excessively damaged, corroded, or clogged, replace. Replace cap and drain cock if damaged or defective. Replace batteries which do not pass inspection with fully charged batteries known to be in good condition. Replace defective hold-down hardware.

e. Installation.

(1) Slide drip pan (78) into skid (79).

(2) Install drip rail (80) on panel (5) using screws (81).

(3) Secure heater strap (84) on manifold with screw (36), nut (37) and washers (38).

(4) Install connector (24) on panel (20) with screw (27), washer (26) and nut (27).

(5) Install panel (71) in shell (75) using screw (72) and nut (74).

(6) Install rear shell (75) using screw (76) and nut (77).

(7) Install hoses (63 and 65) on bracket (66) using clamps (64).

(8) Install brackets (61 and 62) rails (59 and 60) then install fuel tank (57). Install strainer (58) in fuel tank.

(9) Install bracket (53) using screw (54), washer (55) and nut (56).

(10) Install cover (68) on box (67) with screws (69) and washer (70). Install box (67) on bracket (53).

(11) Install shroud (51) using screws (52).

(12) Install radiator (49) and cap (50).

(13) Install shell (43) using screws (44) and nut (45), then install door (46) using screw (47) and nut (48).

(14) Install door jam (32) using screw (33) and nut (34).

(15) Install center panels (28 and 29) using screws (30) and nuts (31).

(16) Install instrument panel (20). Install ground strap (23), then install cover (21) using screws (22).

(17) Install radiator hoses (17 and 18) using clamps (19).

(18) Install exhaust tube (8) using clamps (9 and 10), then install hose and elbow (12).

(19) Install rain cap (13) using screws (14) nut (15) and cotter pin (16).

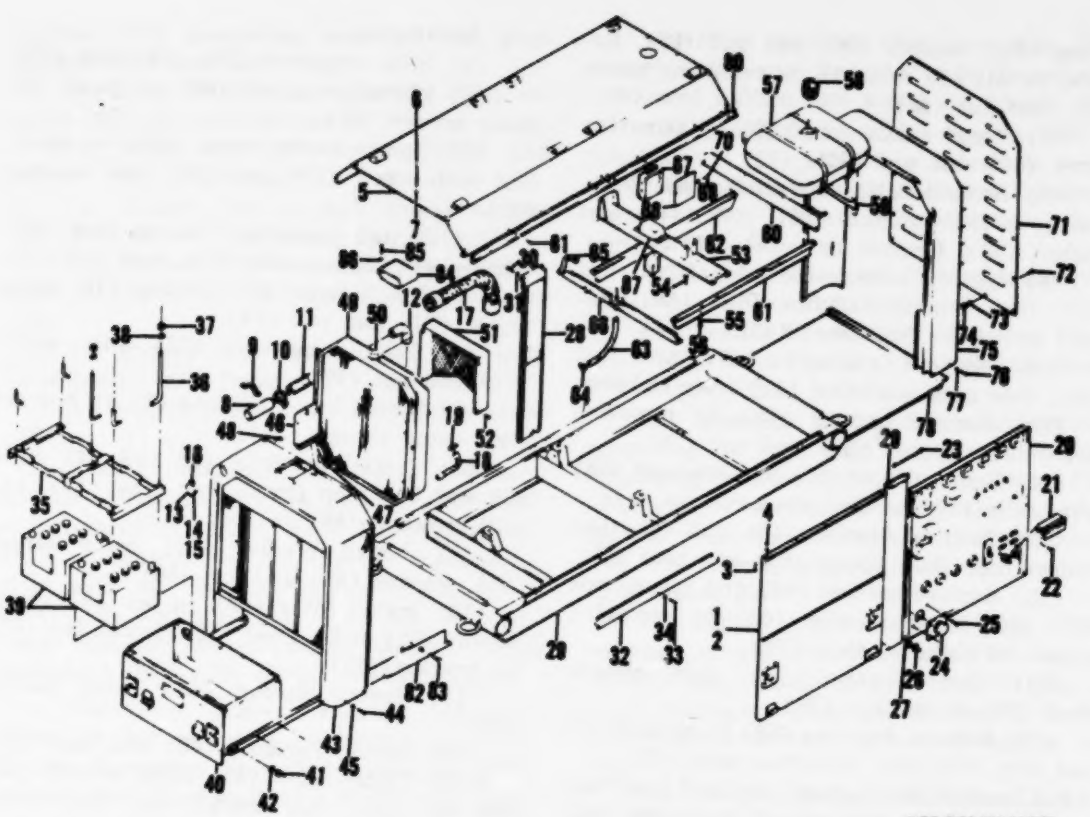
(20) Install top panel (5) using screws (6) and nut (7).

(21) Install side doors (1) using screws (2 and 3) and nuts (4).

6–17. Enclosure

a. Disassembly.

(1) Remove side doors (1) by removing screws (3) and nuts (4).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1	Side door
2	Screw
3	Screw
4	Nut
5	Top panel
6	Screw
7	Nut
8	Exhaust tube
9	Clamp
10	Clamp
11	Hose
12	Elbow
13	Rain cap
14	Screw
15	Nut
16	Cotter pin
17	Hose
18	Hose
19	Clamp
20	Instrument panel
21	Cover
22	Screw
23	Strap
24	Connector
25	Screw
26	Washer
27	Nut
28	Panel
29	Panel
30	Screw
31	Nut
32	Door jam
33	Screw
34	Nut
35	Retainer brackets
36	Hold down studs
37	Nut
38	Washer
39	Battery
40	Battery box
41	Nut
42	Washer
43	Shell
44	Screw
45	Washer
46	Door
47	Screw
48	Nut
49	Radiator
50	Cap
51	Shroud
52	Screw
53	Bracket
54	Screw
55	Washer
56	Nut
57	Tank
58	Strainer
59	Bracket
60	Bracket
61	Rail
62	Rail
63	Hose
64	Clamp
65	Hose
66	Bracket
67	Remote box
68	Cover
69	Screw
70	Washer
71	Panel
72	Screw
73	Washer
74	Nut
75	Shell
76	Screw
77	Washer
78	Drip pan
79	Skid
80	Drip rail
81	Screw
82	Rail
83	Screw
84	Heater strap
85	Screw
86	Washer
87	Relay

Figure 6-42. Enclosure, assembly and disassembly.

(2) Remove top panel (5) by removing screws (6) and nut (7).

(3) Remove exhaust hose (69) by removing clamps (70 and 71) metal tube (72) and elbow (74).

(4) Remove rain cap (65) by removing screw (66), nut (67) and cotter pin (68).

(5) Remove radiator hose (75) by removing clamps (76).

(6) Remove control panel (30), then remove cover (28) by removing screws (29). Remove ground cable (31) from panel.

(7) Remove right hand center panel (33) and left hand center panel (32) by removing screws (34) and nut (35).

(8) Remove door jam (36) by removing screws (37) and nut (38).

(9) Remove shell (96) by removing screw (97) and nut (98), then remove door (99) by removing screw (100) and nut (101).

(10) Remove radiator (81) by removing screw (82). Remove cap (80).

(11) Remove shroud (77) by removing screw (78).

(12) Remove bracket (18) by removing screw (19), washer (20) and nut (21).

(13) Remove brackets (25 and 26) after removing fuel tank (15) and brackets (16 and 17).

(14) Remove remote control box (10) then remove cover (11) by removing screws (12) and washer (13).

(15) Remove hose (24) and hose (22) from bracket (27) by removing clamps (23).

(16) Remove rear shell (58) by removing screw (59) and nut (60).

(17) Remove panel (39) from shell (58) by removing screw (40) and nut (41).

(18) Remove shutter arm (46) by removing screw (53), nut (54), spring (48), screw (47) and nut (49).

(19) Remove link (50) by removing screw (51) and nut (52).

(20) Remove bracket (55) by removing screw (56) and nut (57).

(21) Remove connector (42) by removing screw (43) and nut (44).

(22) Remove heater strap (62) by removing screw (63) and washer (64).

(23) Remove drip rail (8) from top panel (5) by removing screw (9).

(24) Remove drip pans (61 and 102) from skid (2).

b. Cleaning. Wipe grease, dirt and dust from panels and doors with solvent-dampened cloth. Wipe oil drip pan, shutter assemblies and shell assemblies with solvent-dampened cloth. If particularly dirty, clean enclosure and frame with live steam and solvent before wiping with cloths.

c. Inspection. Inspect doors, panels, frames, brackets and shell assemblies for breaks, dents, cracks, or damaged paint. Make sure shutters open freely and close securely. Make sure doors close securely and latches operate properly. Inspect lifting frame for broken or cracked welds and stretched or broken attaching screw holes and lifting eye.

d. Repair. Straighten bent doors and panels and weld members. Replace defective door latches. Replace defective shutter assemblies as a unit. Repair small leaks in radiator with solder. Do not permit solder to flow into radiator core. If radiator is excessively damaged, corroded, or clogged, replace. Replace cap and drain cock if damaged or defective. Replace batteries which do not pass inspection with fully charged batteries known to be in good condition. Replace defective hold-down hardware.

e. Reassembly. Reassemble in reverse order of disassembly.

6–18. Battery Box (Models LEB 300 and LEW 300)

(fig. 6–44)

a. Removal and Disassembly.

(1) Remove lid (1) by unsnapping latch, then remove board (2) by removing screw (3).

(2) Remove leads (7, 8 and 9) from battery (4), then remove terminals (5 and 6). Remove battery.

(3) Remove pin (10), valve (11) and gasket (12) from box (37).

(4) Remove shield (13), heating element (14) and insulation boards (15 and 16).

(5) Remove bracket (17) by removing screw (18), washer (19) and nut (20).

(6) Remove thermostat (21) and switch (26) by removing screws (22 and 27), spacers (23 and 28), washers (24 and 29) and nuts (25 and 30).

(7) Remove board (31) from mount (34) by removing screw (32) and nut (33). Remove mount (34) by removing screw (35).

(8) Remove door (36) from box (37).

b. Cleaning. Clean the batteries with a baking soda solution. Clean all dirt and grease from box using a solvent dampened cloth.

c. Inspection. Inspect batteries for cracks or other visual damage. Inspect electrical cables for frayed or burnt insulation and loose contacts. Inspect heater elements and thermostats for evidence of damage. Refer to battery TM 9-6140-200-15 for other inspections.

d. Reassembly and Installation. To reassemble and install, reverse removal and disassembly procedure.

1	Side door
2	Skid
3	Screw
4	Nut
5	Top panel
6	Screw
7	Nut
8	Drip rail
9	Screw
10	Remote control box
11	Cover
12	Screw
13	Washer
14	Plug
15	Fuel tank
16	Bracket
17	Bracket
18	Bracket
19	Screw
20	Washer
21	Nut
22	Hose
23	Clamp
24	Hose
25	Rail bracket
26	Rail bracket
27	Bracket
28	Cover
29	Screw
30	Control panel
31	Cable
32	Panel
33	Panel
34	Screw
35	Nut
36	Door jam
37	Screw
38	Nut
39	Panel
40	Screw
41	Nut
42	Connector
43	Screw
44	Nut
45	Shutter
46	Arm
47	Screw
48	Spring
49	Nut
50	Link
51	Screw
52	Nut
53	Screw
54	Nut
55	Bracket
56	Screw
57	Nut
58	Shell
59	Screw
60	Nut
61	Drip pan
62	Strap
63	Screw
64	Washer
65	Rain cap
66	Screw
67	Nut
68	Cotter pin
69	Exhaust hose
70	Clamp
71	Clamp
72	Exhaust tube
73	Clamp
74	Elbow
75	Hose
76	Clamp
77	Shroud
78	Screw
79	Cap
80	Radiator cap
81	Radiator
82	Screw
83	Extension
84	Shutter
85	Screw
86	Bracket
87	Bracket
88	Battery box
89	Pin
90	Track
91	Screw
92	Track
93	Hose
94	Hose
95	Jam
96	Shell
97	Screw
98	Nut
99	Door
100	Screw
101	Nut
102	Drip pan
103	Bracket

Figure 6-43—Continued.

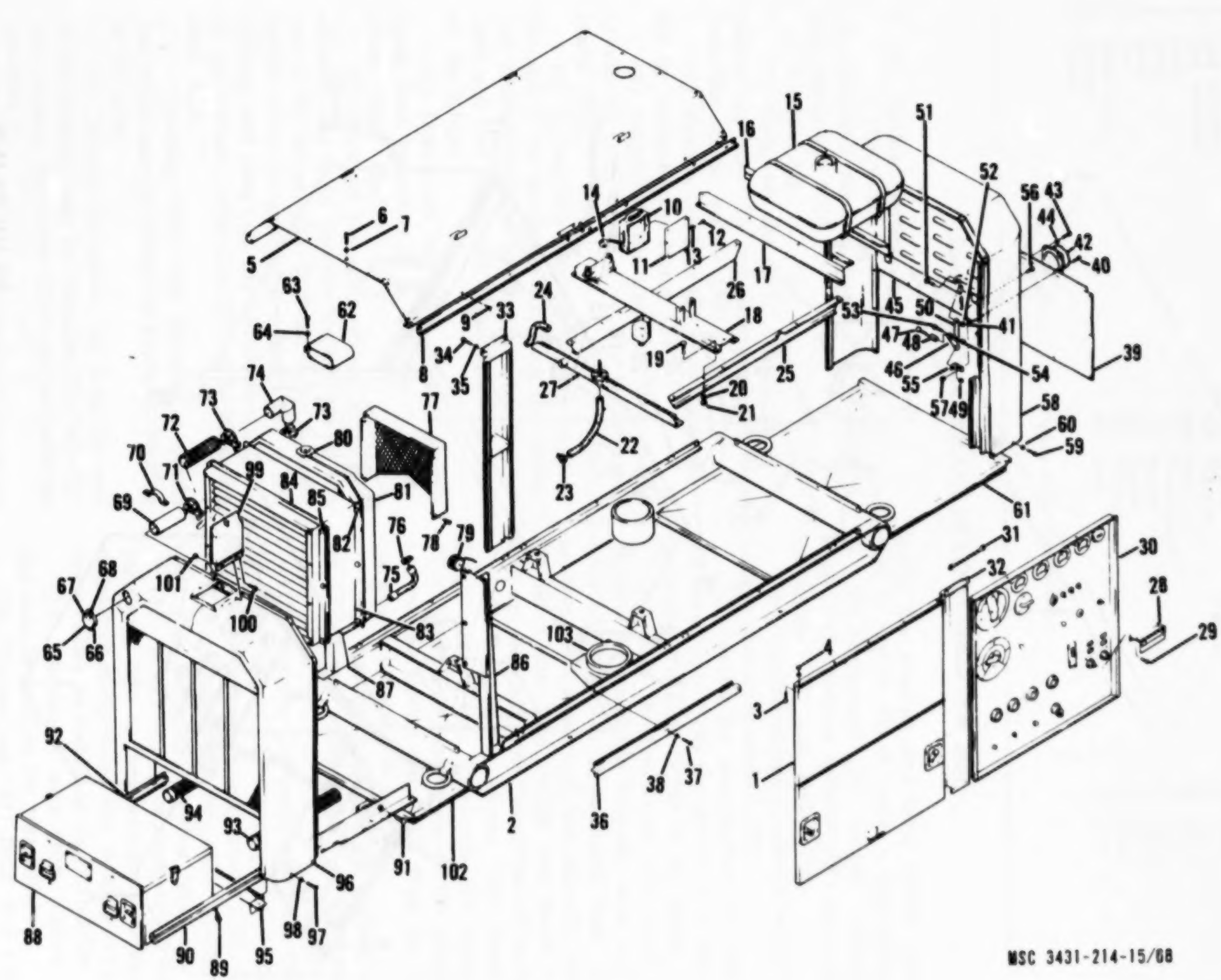
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Figure 6-43. Enclosure, assembly and disassembly.

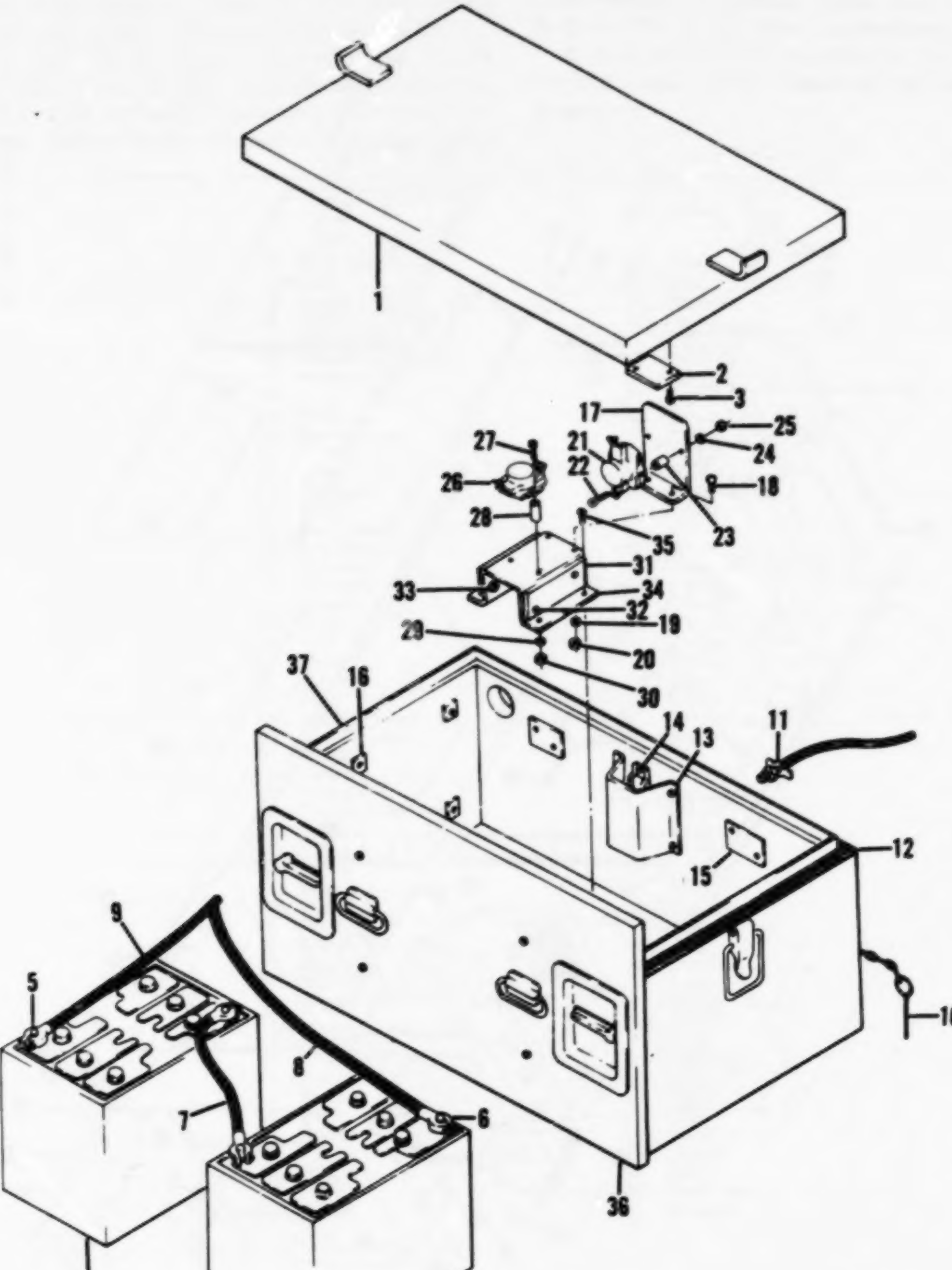
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Figure 6-44. Battery box, assembly and disassembly.

1 Lid
2 Insulation board
3 Screw
4 Battery
5 Lug terminal
6 Lug terminal
7 Lead
8 Lead
9 Lead
10 Pin
11 Drain valve
12 Gasket
13 Shield
14 Element
15 Insulation board
16 Insulation board
17 Bracket
18 Screw
19 Washer
20 Nut
21 Thermostat
22 Screw
23 Spacer
24 Washer
25 Nut
26 Thermostatic switch
27 Screw
28 Spacer
29 Washer
30 Nut
31 Insulation board
32 Screw
33 Nut
34 Mount
35 Screw
36 Door
37 Box

Figure 6-44—Continued.

Section VIII. COOLANT HEATER (Model LEW 300)

6-19. Coolant Heater
(fig. 6-45)

a. Removal. Remove heater in accordance with paragraph 3-43.

b. Disassembly.

(1) Compress the clamp (1)of the combustion air hose (2) and disconnect the hose from the heater burner (40).

(2) Remove the hose (2) from the blower (5) by loosening the clamp (3).

(3) Disconnect the electrical lead of the blower (5) from terminal No. 6 of the terminal board (33).

(4) Loosen the nuts (4) on the studs at the end of the housing (43). Turn the blower (5) counterclockwise to disengage the bayonet slots and pull the entire assembly off the end of the heater.

(5) Disconnect the flame detector switch leads from terminals 2, 3, 4, 6 and 7 of terminal board (33).

(6) Back off the compression nut which attaches the flame detector switch (6) to the end of the burner (4). Pull the flame detector switch wires through the grommet (38) in the housing and then pull the switch straight out of the burner, being careful not to bend the steel tube.

Caution: **This tube contains a quartz rod which may be broken by excessive bending of the tube.**

(7) Remove the cover (8) from the end of the housing (43) by loosening the nuts (7) and turning the cover in a counterclockwise direction.

(8) Disconnect the ground lead (9) by removing nut (10) and lockwasher (11) from inside the housing and bend igniter ground wire so that it will fit inside a deep socket.

(9) Disconnect the copper connecting strap of the preheat resistor (25) and remove the igniter (14) and gasket (16).

(10) Disconnect lead of solenoid valve (17) from temperature control (29).

(11) Loosen the compression nut (22) at the lower end of the standpipe (21) until the standpipe will turn freely in the fitting.

(12) Hold the fuel valve (17) firmly and unscrew the standpipe from the valve. Lift the valve off when the threads are clear. Avoid unnecessary pressure on the solenoid cups of the valve since fuel leakage may result if the cups are loosened from the surface of the body.

(13) Remove the screws (18) from the flange (19) which surrounds the standpipe (21). Leave one flange loose on the standpipe and remove slotted plate (20) from the inside the heater housing (43).

(14) Disconnect lead of the preheat resistor (25) from terminal No. 7 of the terminal board (33).

(15) Remove the compression nut (22) at the lower end of the standpipe (21) and lift out the standpipe, preheat resistor (25), flange (19) and compression nut (22), through the opening in the heater housing (43).

(16) It will usually be necessary to destroy the sleeve (23) on the standpipe to remove the resistor or compression nut. Always use a new sleeve when re-installing the standpipe.

(17) Disconnect wire from control (29) and note its position for reassembly.

(18) Remove nut (27) from stud between

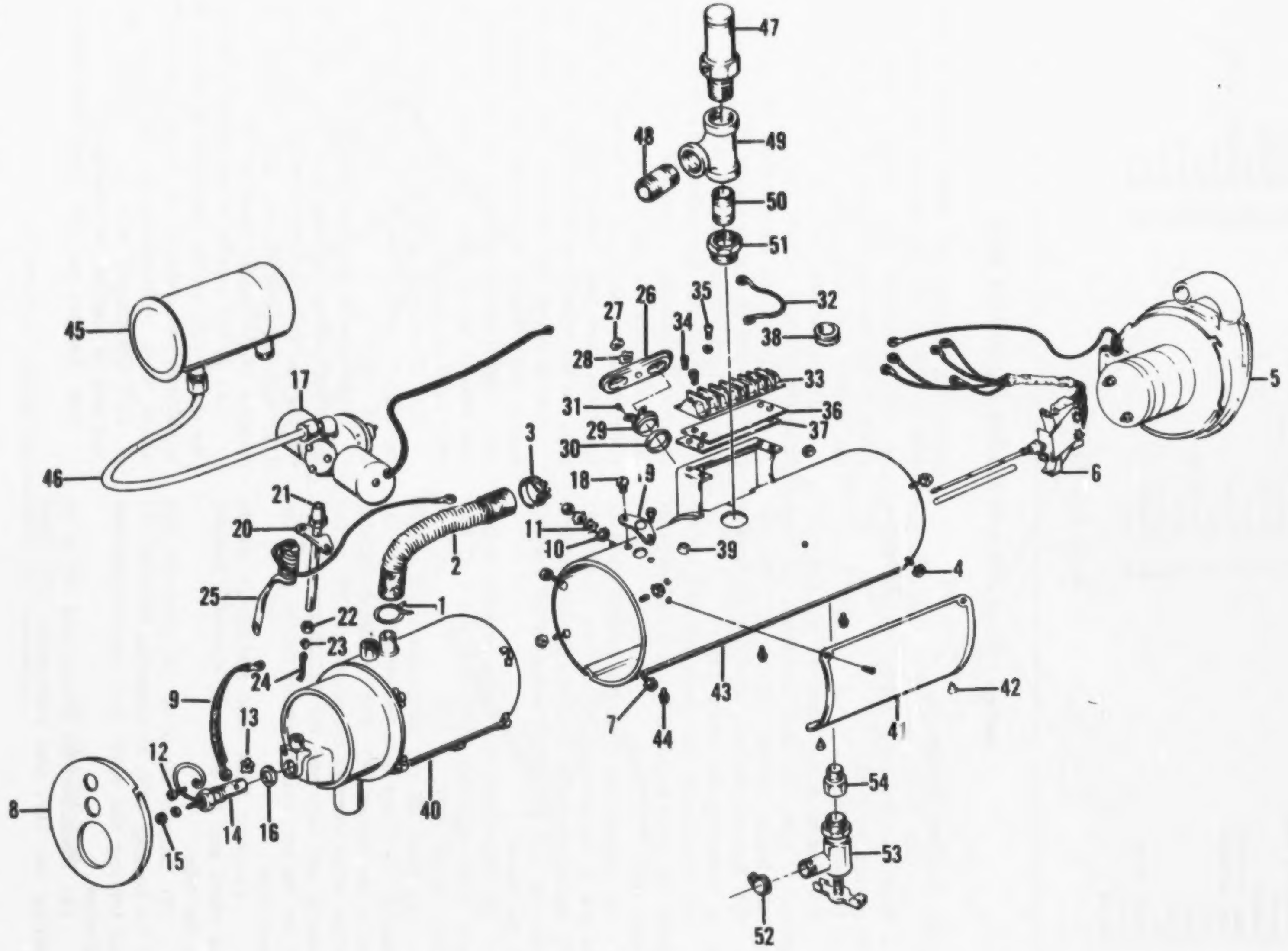
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Figure 6–45. Coolant heater, assembly and disassembly.

1 Clamp
2 Air hose
3 Clamp
4 Nut
5 Blower assembly
6 Flame detector switch
7 Nut
8 Cover
9 Ground lead
10 Nut
11 Lockwasher
12 Screw
13 Lockwasher
14 Igniter
15 Nut
16 Gasket
17 Fuel solenoid valve
18 Screw
19 Flange
20 Plate
21 Standpipe
22 Compression nut
23 Compression sleeve
24 Cable knit
25 Preheat resistor
26 Thermostat cover
27 Nut
28 Lockwasher
29 Temperature control
30 Packing
31 Screw
32 Terminal electrical lead
33 Terminal board
34 Screw
35 Screw
36 Double marker strip
37 Terminal marker support
38 Grommet
39 Grommet
40 Heater burner assembly
41 Nameplate
42 Rivet
43 Housing
44 Screw
45 Fuel pump
46 Hose
47 Relief valve
48 Nipple
49 Tee
50 Nipple
51 Bushing
52 Clamp
53 Valve
54 Bushing

Figure 6–45—Continued.

---

the switches and lift off the cover (26). Remove switches and packing.

(19) Remove terminal board (33) by removing screws (34).

(20) To remove the housing (43), remove the screws (44) from the seam and spread the housing so that it will clear the exhaust tube and coolant fittings. Avoid spreading the housing so far as to cause permanent distortion of its shape.

(17) Disconnect wire from control (29) and note its position for reassembly.

(18) Remove nut (27) from stud between the switches and lift off the cover (26). Remove switches and packing.

(19) Remove terminal board (33) by removing screws (34).

(20) To remove the housing (43), remove the screws (44) from the seam and spread the housing so that it will clear the exhaust tube and coolant fittings. Avoid spreading the housing so far as to cause permanent distortion of its shape.

c. Cleaning. Scrape as much carbon out of the igniter pocket as possible, using a sharp tool, and blow out with compressed air. Remove the combustion residue from the burner by soaking it in a 20% (by weight) solution of ammonium acetate at a temperature of 180° F. for a period of 5 to 10 hours. Drain and rinse the burner thoroughly after soaking, then dry with compressed air.

d. Repair. Replace igniter at each overhaul. Replace fuel inlet screen on the fuel valve. Replace standpipe if evidence of corrosion or damage is found.

e. Adjustment. Adjust the flame detector switch as follows:

(1) Back off the adjusting screw until the switch clicks.

(2) Turn the adjusting screw in slowly until the switch clicks, then turn the screw exactly ¾ turn past the click point.

f. Reassembly. To reassemble, reverse disassembly procedure.

g. Installation. Install heater in accordance with paragraph 3–43.

6–20. Heater Blower Assembly
(fig. 6–46)

a. Removal. Remove blower assembly in accordance with paragraph 3–43.

b. Disassembly.

(1) Remove screws (1) and nut (2) from the flange of the blower.

(2) Lift off the blower cover (3) and loosen the setscrew in the hub of the blower fan (4). Lift the fan off the motor shaft.

(3) Remove the screws (5) which attach the blower housing (6) to the bell end of the motor (7). Lift the motor off, being careful not to lose the screws (5) and spacers (8).

(4) Do not attempt to disassemble or lubricate the motor as it is packed with special low-temperature lubricant.

c. Cleaning. Wash the two halves of the blower housing and the fan in dry cleaning solvent and dry with compressed air. Wipe the motor off with a solvent-dampened cloth.

d. Repair. Replace the entire motor if it is found to be defective.

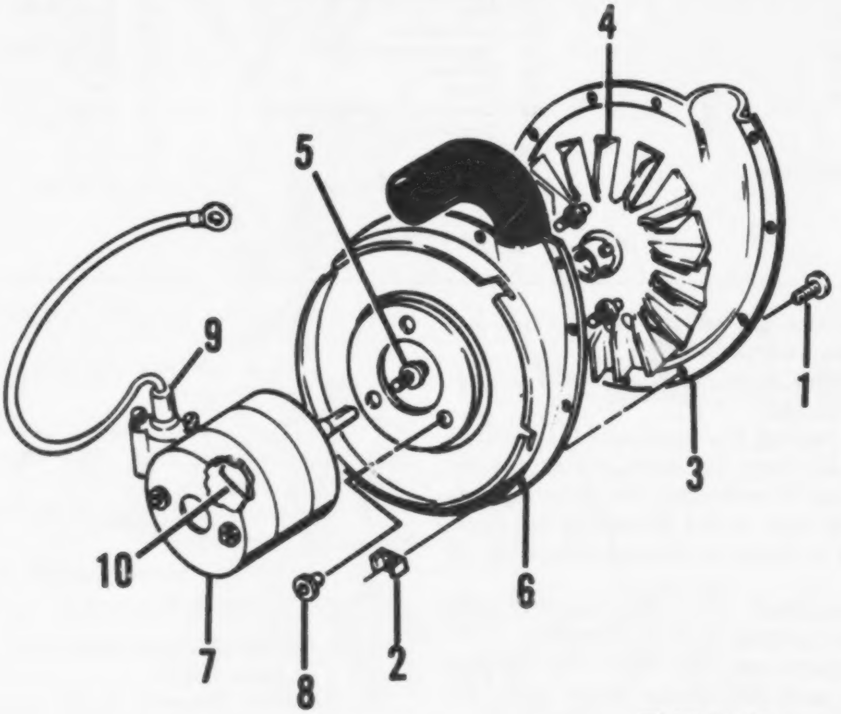
e. Reassembly.

(1) Secure the motor (7) to the blower housing (6) using screws (5) and spacers (8).

(2) Secure blower fan (4) to motor shaft with setscrew. Adjust the blower fan so that the hub is flush with the end of the motor shaft. Hold the blower cover (3) in place and spin the blower fan (4) to make sure the fan does not scrape the housing.

(3) Secure blower cover (3) to housing (6) with screws (1) and nuts (2).

f. Installation. Install blower assembly in accordance with paragraph 3–43.



MSC 3431-214-15/71

1	Screw
2	Nut
3	Blower cover
4	Fan
5	Screw
6	Blower housing
7	Motor
8	Spacer
9	Capacitor
10	Brushes

Figure 6–46. Blower, assembly and disassembly.

APPENDIX A

REFERENCES

---

1. Lubrication

LO 5-3431-205-12	Lubrication Order. Welding Machine, Arc: Generator; Engine Driven, 300 amp (Libby Model LE 300) FSN 3431-810-9696, (Libby Model LEW 300) FSN 3431-991-2961, (Libby Model LEB 300) FSN 3431-072-0827

2. Maintenance

TM 5-3431-205-20P	Organization Maintenance Repair Parts and Special Tools List, Welding Machine, Arc: Generator; Engine Driven, 300 amp (Libby Model LE 300) FSN 3431-810-9696, (Libby Model LEW 300) FSN 3431-991-2961, (Libby Model LEB 300) FSN 3431-072-0827
TM 5-3431-205-35P	DS, GS, and Depot Maintenance Repair Parts and Special Tools List, Welding Machine, Arc: Generator; Engine Driven, 300 amp (Libby Model LE 300) FSN 3431-810-9696, (Libby Model LEW 300) FSN 3431-991-2961, (Libby Model LEB 300) FSN 3431-072-0827

3. Supply Publications

C9100-IL	Petroleum, Petroleum-Base Products, and Related Material.

APPENDIX B

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

1. Scope

This appendix lists items which accompany the arc welding machine or are required for installation, operation, or operator's maintenance.

2. General

This Basic Issue Items List is divided into the following sections:

a. Basic Issue Items—Section II. A list of items which accompany the arc welding machine or are required for operator's maintenance, operation, or installation.

b. Maintenance and Operating Supplies—Section III. A listing of maintenance and operating supplies required for initial operation.

3. Explanation of Columns

The following provides an explanation of columns in the tabular list of basic issue items, section II:

a. Source, Maintenance, and Recoverability Codes (SMR), Column 1:

(1) Source Code indicates the selection status and source for the listed item. Source codes are—

Code	*Explanation*
P	Applied to repair parts which are stockpiled in or supplied from GSA/DSA Army supply system, and authorized for use at indicated maintenance categories.
X2	Applied to repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain them through cannibalization; if not obtainable through cannibalization, such repair parts will be requisitioned with supporting justification through normal supply channels.

(2) Maintenance Code indicates the lowest category of maintenance authorized to install the listed item. The maintenance level code is—

Code	*Explanation*
C	Operator/crew
O	Organizational maintenance

(3) Recoverability Code indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are—

Code	*Explanation*
R	Applied to repair parts and assemblies which are economically raparable at DSU and GSU activities and are normally furnished by supply on an exchange basis.
T	Applied to high dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts are normally repaired or overhauled at depot maintenance activities.
U	Applied to repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, high dollar value reusable casings and castings.

b. Federal Stock Number, Column 2. This column indicates the Federal stock number for the item.

c. Description, Column 3. This column indicates the Federal item name and any additional description required. A five-digit manufacturer's or other service code is shown in parentheses followed by the manufacturer's part number. Repair parts quantities included in kits, sets, and assemblies that differ from the actual quantity used in the specific item, are listed in parentheses following the repair part name.

d. Unit of Issue, Column 4. This column indicates the unit used as a basis of issue, e.g., ea, pr, ft, yd, etc.

e. Quantity Incorporated in Unit Pack, Column 5. This column indicates the actual quantity contained in the unit pack.

f. Quantity Incorporated in Unit, Column 6. This column indicates the quantity of the item used in the equipment.

g. Quantity Furnished With Equipment, Column 7. This column indicates the quantity of an item furnished with the equipment.

h. Quantity Authorized, Column 8. This column indicates the quantity of an item authorized the operator/crew to have on hand or to obtain as required. As required items are indicated with an asterisk.

j. Illustration, Column 9. This column is divided as follows:

(1) Figure Number, column 9a, indicates the figure number of the illustration in which the item is shown.

(2) Item Number, column 9b, indicates the callout number used to reference the item in the illustration.

4. Explanation of Columns in the Tabular List of Maintenance and Operating Supplies—Section III

a. Item, Column 1. This column contains numerical sequence items numbers assigned to each component application to facilitate reference.

b. Component Application, Column 2. This column identifies the component application of each maintenance or operating supply item.

c. Federal Stock Number, Column 3. This column indicates the Federal Stock Number for the item and will be used for requisitioning purposes.

d. Description, Column 4. This column indicates the item and a brief description.

e. Quantity Required for Initial Operation, Column 5. This column indicates the quantity of each maintenance or operating supply item required for initial operation of the equipment.

f. Quantity Required for 8 Hours Operation, Column 6. This column indicates the estimated quantities required for an average eight hours of operation.

g. Notes, Column 7. This column indicates informative notes keyed to data appearing in a preceding column.

5. Abbreviations

amp	ampere(s)
dia	diameter(s)
id	inside diameter(s)
in.	inch(es)
lb	pound(s)
lg	length(long)
lh	left hand
mtg	mounting(s)
No.	number(s)
od	outside diameter(s)
rh	right hand
thd	thread(s) (ed)
thk	thick(ness)
v	volt(s)

6. Federal Supply Code

Codes	*Manufacturers*
00000	Ordnance Corp.
00736	Air-Maze Division of Rockwell Standard Corp.
04009	Arrow, Hart, and Hegeman Electric Co.
04255	Weatherhead Co.
06840	Bendix Corp.
08484	Breeze Corporations, Inc.
14351	Continental Motors Corp.
14655	Cornell Dubilier Electric Corp.
16764	Delco Remy Division of General Motors Corp.
19239	Echlin Mfg. Co.
24446	General Electric Co.
36024	Libby Welding Co.
36232	Lincoln Electric Co.
38443	Marlin-Rockwell Corp.
51240	American-Standard Controls Division of American Radiator and Standard Sanitary Corp.
56289	Sprague Electric Co.
65092	Weston Instruments Division of Daystrom, Inc.
70040	AC Spark Plug Division of General Motors
71400	Bussman Mfg. Division of McGraw-Edison Co.
71747	Chicago Hardware and Fixture Co.
72055	Clum Mfg. Co.
72619	Dialight Corp.
72653	General Cement Division of Textron, Inc.
73370	Fram Corp.
74465	Hoof Products Co.
74545	Hubbell Harvey, Inc.
76062	MRC Bearing Service Co.
76255	McQuay-Norris Mfg. Co.
77342	Potter and Brumfield Division of American Machine and Foundry Co.
78189	Shakeproof Division of Illinois Tool Works
78385	South Wind Division of Stewart Warner Corp.
79189	Warren Boat Yard, Inc.
79470	Weatherhead Co.

79960	**Zenith Carburetor Division of Bendix Corp.**
82796	**Fairbanks Morse and Co., Beloit Works Division**
88044	**Aeronautical Standards Group, Department of Navy and Air Force**
88223	**General Products Corp., Union Springs**
94257	**DeKoven Mfg. Co.**
96906	**Military Standards**

Section II. BASIC ISSUE ITEMS LIST

(1) Source, maint, and recov code (A) S	(1) (B) M	(1) (C) R	(2) Federal stock No.	(3) Description	(4) Unit of issue	(5) Qty inc in unit pack	(6) Qty inc in unit	(7) Qty furn with equip	(8) Qty auth	(9) Illustration (A) Fig No.	(9) Illustration (B) Item No.
				GROUP 31-BASIC ISSUE ITEMS, MANUFACTURER INSTALLED							
				3100-BASIC ISSUE ITEMS, MANUFACTURER OR DEPOT INSTALLED							
P	O	--	6140-057-2554	BATTERY	--	--	--	2	2		
P	O	--	6810-264-9063	ELECTROLYTE	Gal	--	--	2	2		
P1	O	--	6140-088-5565	CABLE ASSEMBLY, GROUND	--	--	--	1	1		
P1	O	--	3431-954-4215	CABLE ASSEMBLY, GROUND (Model LEW 300)	--	--	--	1	1		
P1	O	--	6140-088-5566	CABLE ASSEMBLY, ELECTRODE	--	--	--	1	1		
P1	O	--	3431-954-4215	CABLE ASSEMBLY, ELECTRODE (Model LEW 300)	--	--	--	1	1		
P1	O	--	3442-618-0115	ELECTRODE HOLDER INS	--	--	--	1	1		
X2	O	--	3431-930-8779	REMOTE CONTROL	--	--	--	1	1		
P1	O	--	7520-559-9618	CASE, Operation and Maintenance Publications, Cotton Duck, Water Repellent, Mildew Resistant, MIL-B-11743B.	--	--	--	1	1		
				DEPARTMENT OF THE ARMY LUBRICATION ORDER LO 5-3431-205-12.	--	--	--	1	1		
				DEPARTMENT OF THE ARMY OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT, GENERAL SUPPORT AND DEPOT MAINTENANCE MANUAL TM 5-3431-205-15.	--	--	--	2	2		
P	O	--	4210-555-8837	FIRE EXTINGUISHER, Monobromotrifluormethane CF₃BR	--	--	--	1	1		
				GROUP 32-BASIC ISSUE ITEMS TROOP INSTALLED							
				3200-BASIC ISSUE ITEMS, TROOP INSTALLED OR AUTHORIZED.							
P	O	--	5975-642-8937	ROD, Ground (9 ft lg in 3 ft sections 5/8 in. dia.)	--	--	--	--	1		
P	O	--	5975-243-5861	CLAMP	--	--	--	--	1		
P	O	--	6145-189-6695	WIRE Electrical No. 6 AWG (Requisition as required)	ft						

Section III. MAINTENANCE AND OPERATING SUPPLIES

(1) Item	(2) Component Application	(3) Federal Stock number	(4) Description	(5) Quantity required F/Initial operation	(6) Quantity required F/8 hrs operation	(7) Notes
1	0101 CRANKCASE (1)		OIL, LUBRICATING: 5 gal pails as follows			(1) Includes quantity of oil to fill engine system as follows: 5 qt crankcase 1 qt oil filter
		9150-265-9453 (2)	OE-30	6 qt	(3)	
		9150-265-9428 (2)	OE-10	6 qt	(3)	(2) See C9100-1L for additional data and requisitioning procedures.
		9150-242-7603 (2)	OES	6 qt	(3)	(3) See current LO for grade application and replenishment intervals. (4) Tank capacity.
2	0304 AIR CLEANER		OIL, LUBRICATING: 5 gal pails as follows			(5) For quantities, ambient temperatures, specific gravities, and replenishment data refer to table 2-1.
		9150-265-9453 (2)	OE-30	½ qt		(6) Average fuel consumption 2.35 gal per hour of continuous operation. Model LEW 300 fuel consumption is 2.61 gal per hour).
		9150-265-9428 (2)	OE-10	½ qt		
		9150-242-7603 (2)	OES	½ qt		(7) Quantity indicated is the minimum required for one each start when temperature is −40°F.
3	FUEL TANK		FUEL, GASOLINE: bulk as follows:			
		9130-160-1818	Automotive, Combat 91A (8)	15 gal (4)	20.88 gal (6)	(8) Model LEW 300 only.
		9130-160-1839	Automotive, Combat 91C (8)	15 gal (4)	20.88 gal (6)	(9) Model LEB 300 only.
4	RADIATOR		WATER	13 gal (9) (4) 15 qt 20 qt. (10)	18.88 gal (6)	(10) Model LE 300 only.
			ANTIFREEZE: 5 gal can as follows:			
		6850-224-8730	ANTIFREEZE: Ethylene glycol	8 qt (8)		
			ANTIFREEZE: 55 gal drum as follows:			
		6850-174-1806	Compound artic	20 qt		
		6850-244-8730	Inhibited glycol	11 qts (9)		
5	ENGINE STARTING AID (9)	2910-355-6377	Cartridge, Engine Starter, Steel Case.	1 (7)		

APPENDIX C

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. No special tools or test equipment required for maintenance functions.

d. Section III contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance function.

2. Explanation of Columns in Section II

a. Group Number. Column 1. The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes (obtained from TB 705-93-1, Functional Grouping Codes) are listed on the MAC in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. Functional Group. Column 2. This column contains a brief description of the components of each functional group.

c. Maintenance Functions. Column 3. This column lists the various maintenance functions (A through K) and indicates the lowest maintenance category authorized to perform these functions. The symbol designations for the various maintenance categories are as follows:

C—Operator or crew
O—Organizational maintenance
F—Direct support maintenance
H—General support maintenance
D—Depot maintenance

The maintenance functions are defined as follows:

A—INSPECT.	To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.
B—TEST.	To verify serviceability and to detect electrical or mechanical failure by use of test equipment.
C—SERVICE.	To clean, to preserve, to charge, to paint, and to add fuel, lubricants, cooling agents, and air.
D—ADJUST.	To rectify to the extent necessary to bring into proper operating range.
E—ALIGN.	To adjust specified variable elements of an item to bring to optimum performance.
F—CALIBRATE.	To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

G—INSTALL.	To set up for use in an operational environment such as an emplacement, site, or vehicle.
H—REPLACE.	To replace unserviceable items with serviceable assemblies, subassemblies, or parts.
I—REPAIR.	To restore an item to serviceable condition. This includes, but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, riveting, and strengthening.
J—OVERHAUL.	To restore an item to a completely serviceable condition as prescribed by maintenance serviceability standards using the Inspect and Repair Only as Necessary (IROAN) technique.
K—REBUILD.	To restore an item to a standard as nearly as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements (items) using original manufacturing tolerances and specifications, and subsequent reassembly of the item.

d. Remarks. Column 4. This column is provided for referencing by code the remarks (Section III) pertinent to the maintenance functions.

3. Explanation of Columns in Section III

a. Reference Code. This column consists of two letters separated by a dash, both of which are references to section II. The first letter references column 5 and the second letter references a maintenance function, column 3, A through K.

b. Remarks. This column lists information pertinent to the maintenance function being performed, as indicated on the MAC, section II.

Section II. MAINTENANCE ALLOCATION CHART

(1)	(2)	(3) Maintenance functions											(4)
		A	B	C	D	E	F	G	H	I	J	K	
Group No.	Functional group	Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild	Remarks
01	**ENGINE:**												
0100	**Engine assembly**												
	Engine, gasoline	C	O	C	--	--	--	--	H	H	D	D	A
0101	**Crankcase, Block, Cylinder Head**												
	Block, engine	--	--	--	--	--	--	--	H	H			
0102	**Crankshaft**												
	Crankshaft	--	--	--	--	--	--	--	H	--	--	D	B
0103	**Flywheel Assembly**												
	Flywheel assembly	--	--	--	--	--	--	--	H	H	--	--	C
0104	**Pistons, Connecting Rods**												
	Piston assembly	--	--	--	--	--	--	--	H	H			
	Rod assembly, connecting	--	--	--	--	--	--	--	H	H			
0105	**Valves, Camshafts, and Timing System**												
	Lifter, assembly, valve	--	--	--	O	--	--	--	H				
	valves and seats	--	--	--	--	--	--	--	H	H	--	--	D
0106	**Engine Lubrication System**												
	Filter assembly, oil	--	--	--	--	--	--	--	H	H	--	--	E
	Pump assembly, oil	--	--	C	--	--	--	O					
	Valve, oil pressure relief	--	--	--	--	--	--	O					
0108	**Manifolds**												
	Manifold	--	--	--	--	--	--	O					
03	**FUEL SYSTEM:**												
0301	**Carburetor**												
	Carburetor, float	--	--	O	C	--	--	--	O	--	--	--	F
0304	**Air Cleaner**												
	Cleaner assembly, air	--	--	C	--	--	--	O					
0306	**Tanks, Lines, Fittings**												
	Tank, fuel	--	--	C	--	--	--	--	O	F			
0308	**Engine Speed Governor and Controls**												
	Governor assembly	--	--	--	O	--	--	--	O	F			
	Regulator, generator idle	--	--	--	--	--	--	--	O	F			
0309	**Fuel Filters**												
	Filter, fuel	--	--	C	--	--	--	--	O	O			
04	**EXHAUST SYSTEM**												
05	**COOLING SYSTEM:**												
0501	**Radiator**												
	Radiator	--	F	C	--	--	--	--	O	F			
0503	**Watermanifold, Headers, Thermostats and Housing Gaskets**												
	Thermostat, flow control	O	--	--	--	--	--	O					
0505	**Fan Assembly**												
	Belt, V	--	--	--	C	--	--	--	O				

Section II. MAINTENANCE ALLOCATION CHART

(1)	(2)	(3) Maintenance functions											(4)
		A	B	C	D	E	F	G	H	I	J	K	
Group No.*	Functional group	Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild	Remarks
06	ELECTRICAL SYSTEM:												
0601	Generator Generator assembly	..	O	..	..	..	..	..	O	F	..	..	G
0602	Generator Regulator: Regulator, engine generator	..	O	..	O	..	..	..	O	..	..	..	
0603	Starting Motor Starter, engine electrical	..	O	..	..	..	..	..	O	F	..	..	H
0605	Ignition Components Magneto, ignition	..	..	..	O	..	..	..	O	F	..		I
	spark, plugs	..	..	O	O	..	..	..	O				
0607	Instrument or engine control Panel Wiring harness	..	..	..	..	..	..	..	F	O			
0612	Batteries, Storage Battery, storage	..	O	C	..	..	..	..	O				
2207	Winterization Equipment Heater, coolant, engine	..	H	C	..	..	..	..	O	O	H	..	J
44	Welding, Metalizing, Metal Heating, and Plating Equipment												
4400	Arc Welder Generator assembly	C	F	C	..	..	..	..	H	D			
4401	Rotor Assembly Armature, generator and exciter	..	F	..	..	..	..	..	F	F	D	D	K
4402	Stator Assembly Coils, generator and exciter	..	F	..	..	..	..	..	F	F	D	D	L
4407	Controls Panels, Housing Cubicles Box, Remote	..	..	..	..	..	..	..	O	O			
	Wiring	..	..	..	..	..	..	..	F	O			
4411	Resistor Components Coil, current, reactor	..	F	..	..	..	..	..	F				
	resistor, adjustable	F	..	..	..	F	..	..	F				
	resistor, fixed	F	..	..	..	F	..	..	F				
4414	Radio Interference Suppression Capacitors	O	..	..	..	..	..	..	O				

Section III. MAINTENANCE FUNCTIONS

Reference code	*Remarks*
A–B	**Test includes engine operation and compression**
B–K	**Rebuild of crankshaft includes metalizing, aligning, and regrinding**
C–1	**Repair of flywheel includes replacing ring gear**
D–1	**Repair of valves and seats includes refacing**
E–1	**Repair of oil pump includes installing repair kit**
F–D	**Adjust of carburetor is external only**
G–I	**Repair of generator includes installing repair kit**
H–I	**Repair of starter includes installing repair kit**
I–I	**Repair of magneto includes installing repair kit**
J–B	**Test includes bench test**
K–K	**Rebuild of armature includes rewind of armature**
L–K	**Rebuild of stator includes rewind of coil**

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By Order of the Secretary of the Army:

WILLIAM C. WESTMORELAND,
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Chief of Staff.

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The Adjutant General.

Distribution:

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Chart Transposed to

End of Volume.

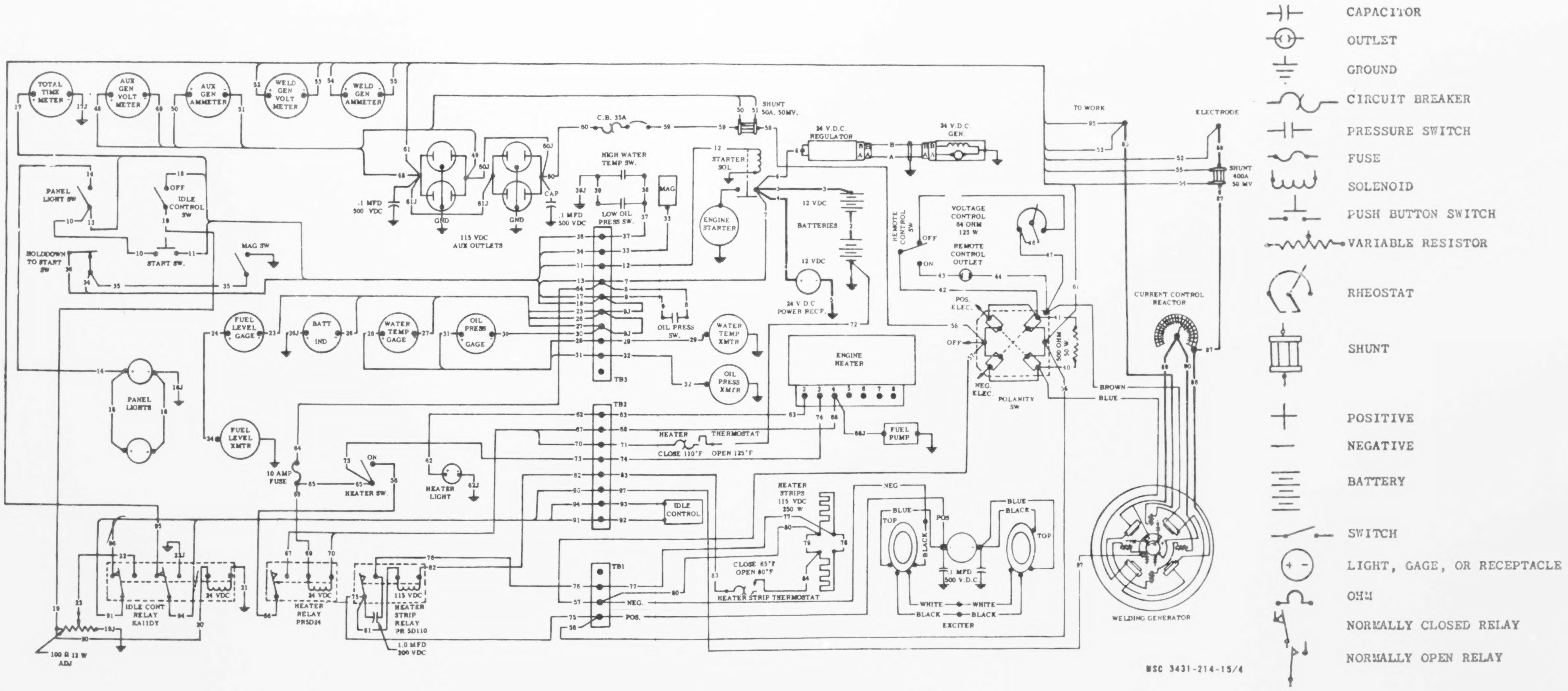
TOTAL TIME METER
AUX GEN VOLT METER
AUX GEN AMMETER
WELD GEN VOLT METER
WELD GEN AMMETER
SHUNT 50A, 50MV.
C.B. 35A
34 V.D.C. REGULATOR
34 V.D.C GEN
TO WORK
ELECTRODE
SHUNT 400A 50 MV
PANEL LIGHT SW
IDLE CONTROL SW
OFF
HOLDDOWN TO START SW
START SW.
MAG SW
.1 MFD 500 VDC
CAP
GND
115 VDC AUX OUTLETS
HIGH WATER TEMP SW.
LOW OIL PRESS SW.
MAG
STARTER SOL
ENGINE STARTER
12 VDC
BATTERIES
24 V.D.C. POWER RECP.
REMOTE CONTROL SW
ON
VOLTAGE CONTROL 64 OHM 125 W
REMOTE CONTROL OUTLET
FUEL LEVEL GAGE
BATT IND
WATER TEMP GAGE
OIL PRESS GAGE
OIL PRESS SW.
WATER TEMP XMTR
OIL PRESS XMTR
TB3
ENGINE HEATER
POS. ELEC.
NEG. ELEC
POLARITY SW
CURRENT CONTROL REACTOR
BROWN
BLUE
PANEL LIGHTS
FUEL LEVEL XMTR
10 AMP FUSE
HEATER SW.
HEATER LIGHT
TB2
HEATER
THERMOSTAT
CLOSE 110°F
OPEN 125°F
FUEL PUMP
IDLE CONTROL
HEATER STRIPS 115 VDC 250 W
NEG
POS
TOP
BLACK
WHITE
1 MFD 500 V.D.C.
EXCITER
WELDING GENERATOR
IDLE CONT RELAY KA11DY
24 VDC
HEATER RELAY PR5D24
115 VDC
HEATER STRIP RELAY PR 5D110
1.0 MFD 200 VDC
TB1
NEG.
POS.
CLOSE 65°F
OPEN 80°F
HEATER STRIP THERMOSTAT
100 Ω 12 W ADJ
MSC 3431-214-15/4
CAPACITOR
OUTLET
GROUND
CIRCUIT BREAKER
PRESSURE SWITCH
FUSE
SOLENOID
PUSH BUTTON SWITCH
VARIABLE RESISTOR
RHEOSTAT
SHUNT
POSITIVE
NEGATIVE
BATTERY
SWITCH
LIGHT, GAGE, OR RECEPTACLE
OHM
NORMALLY CLOSED RELAY
NORMALLY OPEN RELAY

*Figure 1-4*③—Continued (*Model LEW 300*).